



Report Number: 100657879MIN-008

Project Number: G100657879

**Testing performed on the
3 series B13d, A2 B13d, Start B13d, tour R312d, 3 series B312d, A2 B312d,
Start B312d, tour B312d, 3 series 13P+, A2 13P+, Start 13P+, 3 series CIC, A2 CIC,
Start CIC, 3 series ITE, A2 ITE, Start ITE, 3 series ITC, A2 ITC, Start ITC,
3 series R312d, A2 R312d, Start R312d, tour R312d,
Xino mR312d, A2 mR312d, Start mR312d**

FCC ID: EOA- 3SER312

Industry Canada ID: 6903A- 3SER312

to

47 CFR Part 15. 249:2013

RSS- 210, Issue 8, 2010

RSS-Gen, Issue 3, 2010

ICES-003, Issue 5:2012

47 CFR, Part 15:2013, §15.107 and §15.109, Class B

For

Starkey Laboratories, Inc.

Test Performed by:
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Test Authorized by:
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Date: August 26, 2014

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Date: August 26, 2014

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1.0 GENERAL DESCRIPTION

Model:	3 series R312d
Type of EUT:	Hearing Aid
Serial Number ID:	9231
FCC ID:	EOA- 3Ser312
Industry Canada ID:	6903A- 3Ser312
Related Submittal(s) Grants:	None
Company:	Starkey Laboratories Inc.
Customer:	Mr. Ken Meyer
Address:	6700 Washington Avenue South Eden Prairie, MN 55344 USA
Phone:	(952) 947-4734
Fax:	(952) 828-9262
E-mail:	ken_meyer@starkey.com
Test Standards:	☒ 47 CFR, Part 15:2013, §15.249 ☒ RSS-210, Issue 8, 20010 ☒ RSS-Gen, Issue 3, 2010 ☒ 47 CFR, Part 15:2013, §15.107 and §15.109, Class B ☒ ICES-003, Issue 5:2012 ☐ Other
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	March 5, 2012
Test Work Started:	March 5, 2012
Test Work Completed:	August 25, 2014
Test Sample Conditions:	☐ Damaged ☐ Poor (Usable) ☒ Good



1.1 Product Description; Test Facility

Product Description:	Hearing Aid
Operating Frequency	902.67-926.96MHz
Number of Channels	81
Modulation:	FSK
Emission Designator:	384K6FXD
Antenna(s) Info:	Integral
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Transmitter Power Configuration:	☒ Internal battery ☐ External power source ☐ 120VAC ☐ 230VAC ☐ 400VAC ☒ 1.4 VDC ☐ Other: Amp. ☐ 50Hz ☐ 60Hz
Special Test Arrangement:	None
Test Facility Accreditation:	A2LA (Certificate No. 1427.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2009

1.2 EUT Configuration

The equipment under test was operated during the measurement under the following conditions:

- ☐ - Standby
- ☒ - Continuous
- ☐ - Continuous un-modulated
- ☐ - Test program (customer specific)
- ☐ -

Operating modes of the EUT:

No.	Description
1	The device was pre-programmed to operate continuously in three separate frequency channels, low, middle, and upper frequency channel, one channel being transmitted at a given time.
2	Standby / Receiving mode were used for FCC Part 15.109 Class B, ICES-003 testing and RSS-Gen.

Cables:

No.	Type	Length	Designation	Note
1	None			

Support equipment/Services:

No.	Item	Description
1	R&S SMR20	Signal Generator, used to activated Hearing Aid in receiving mode

Note: According to the manufacturer models: 3 series B13d, A2 B13d, Start B13d, tour R312d, 3 series B312d, A2 B312d, Start B312d, tour B312d, 3 series 13P+, A2 13P+, Start 13P+, 3 series CIC, A2 CIC, Start CIC, 3 series ITE, A2 ITE, Start ITE, 3 series ITC, A2 ITC, Start ITC, 3 series R312d, A2 R312d, Start R312d, tour R312d, Xino mR312d, A2 mR312d, and Start mR312d are electrically identical.

The Model: 3 series R312d was tested as a representative model.

1.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

☒ Normal

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

1.4 Measurement uncertainty

The expanded uncertainty ($k = 2$) for radiated emissions from 30 to 1000 MHz has been determined to be: ± 4 dB at 10m and ± 5.4 dB at 3m

The expanded uncertainty ($k = 2$) for conducted emissions from 150 kHz to 30 MHz has been determined to be:
 ± 2.6 dB

1.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured emissions reading on the EMI Receiver.

The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field Strength in dB(μ V/m)

RA = Receiver Amplitude in dB(μ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB(m^{-1})

AG = Amplifier Gain in dB

Assume a receiver reading of 48.1 dB(μ V) is obtained. The antenna factor of 7.4 dB(m^{-1}) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dB is subtracted giving field strength of 41.1 dB(μ V/m).

$$RA = 48.1 \text{ dB}(\mu\text{V})$$

$$AF = 7.4 \text{ dB}(m^{-1})$$

$$CF = 1.6 \text{ dB}$$

$$AG = 16.0 \text{ dB}$$

$$FS = RA + AF + CF - AG$$

$$FS = 48.1 + 7.4 + 1.6 - 16.0$$

$$FS = 41.1 \text{ dB}(\mu\text{V}/\text{m})$$

General notes:

2.0 TEST SUMMARY

Referring to the performance criteria and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards.

TEST SPECIFICATION	TEST PARAMETERS	RESULT
15.249(a) / RSS-210 A2.9(a)	Field strength of fundamental	Pass
15.249(a) / RSS-210 A2.9(a)	Field strength of harmonics	Pass
15.249(d) / RSS-210 A2.9(b)	Field strength of spurious emissions	Pass
15.215(c) / RSS- Gen 4.6.1	Bandwidth of the emission	Pass
15.207/RSS-Gen 7.2.2	Transmitter Power Line conducted emissions	N/A
15.109/ICES-003	Receiver/digital device radiated emissions	Pass
15.107/ ICES-003	Digital device conducted emissions	N/A



3.0 TEST CONDITIONS AND RESULTS

3.1 Field strength of fundamental

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Max. Emissions margin at fundamental: 16.9dB below the limits

Notes: None

Date:	August 25, 2014	Result: Pass
Standard:	FCC 15.249(a) / RSS-210 A2.9	
Tested by:	Richard Blonigen	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	None	

Table 3.1.1

Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	Reading	Total @ 3m	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBμV	dBμV/m	dBμV/m	dB	
Channel 353										
902.67	V	100	21.8	3.6	0.0	49.3	74.7	94.0	-19.3	Pk
902.67	H	157	21.8	3.6	0.0	41.8	67.2	94.0	-26.8	Pk
Channel 393										
914.71	V	100	21.9	3.6	0.0	50.9	76.4	94.0	-17.6	Pk
914.71	H	160	21.9	3.6	0.0	44.6	70.1	94.0	-23.9	Pk
Channel 433										
926.96	V	100	22.0	3.7	0.0	51.5	77.1	94.0	-16.9	Pk
926.96	H	173	22.0	3.7	0.0	47.0	72.6	94.0	-21.4	Pk



3.2 Field strength of harmonics and spurious emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Frequency range of measurements: 30MHz-10000MHz

Test result: **Pass**

Max. margin of harmonics and spurious emissions: 1.1dB below the limits

Notes: Transmitting fundamental frequencies were excluded from the table.

Date:	March 5-6, 2012 & August 25, 2014	Result: Pass
Standard:	FCC 15.249(a) and (d) / RSS-210 A2.9	
Tested by:	Uri Spector & Richard Blonigen	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	30MHz-1000MHz	

Table 3.2.1

Frequency	Ant. Polarity	Peak Reading dBμV	Ant.Factor dB1/m	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
Ch. 353						
31.313 MHz	V	7.3	19.5	24.7	40.0	-15.3
128.2 MHz	V	11.1	13.7	25.5	43.5	-18.1
628.25 MHz	V	10.3	21.7	31.8	46.0	-14.2
736.45 MHz	V	10.9	22.5	33.5	46.0	-12.6
788.73 MHz	V	11.2	23.2	33.8	46.0	-12.2
937.11 MHz	V	11.5	24.7	35.1	46.0	-10.9
30.084 MHz	H	6.0	20.2	26.2	40.0	-13.8
128.17 MHz	H	12.2	13.7	25.9	43.5	-17.6
Ch. 393						
31.42 MHz	V	8.1	19.5	27.6	40.0	-12.4
38.104 MHz	V	10.6	15.8	26.4	40.0	-13.6
99.702 MHz	V	15.7	12.4	28.1	43.5	-15.4
132.53 MHz	V	11.8	13.8	25.6	40.0	-14.5
262.06 MHz	V	10.1	16.2	26.2	46.0	-19.8
368.92 MHz	V	11.2	18.0	29.2	46.0	-16.8
31.42 MHz	H	7.9	19.5	27.5	40.0	-12.5
99.702 MHz	H	12.4	12.4	24.8	43.5	-18.7
102.16 MHz	H	11.7	12.7	24.4	43.5	-19.1
122.31 MHz	H	10.3	14.0	24.3	43.5	-19.3
Ch. 433						
31.264 MHz	V	7.8	19.5	25.2	40.0	-14.8
91.151 MHz	V	12.2	10.3	23.8	43.5	-19.7
98.532 MHz	V	12.8	11.9	26.0	43.5	-17.6
132.22 MHz	V	11.8	13.5	26.0	43.5	-17.5
31.153 MHz	H	7.5	19.6	27.1	40.0	-12.9
275.58 MHz	H	18.7	15.1	33.7	46.0	-12.3
414.81 MHz	H	10.6	19.6	30.2	46.0	-15.8
637.15 MHz	H	12.7	21.9	34.6	46.0	-11.4
662.02 MHz	H	16.2	22.0	38.2	46.0	-7.8

Date:	March 5-6, 2012	Result: Pass
Standard:	FCC 15.249(a) and (d) / RSS-210 A2.9	
Tested by:	Uri Spector	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	1000MHz-10000MHz	

Table 3.2.2

Frequency MHz	Antenna Polarity	Reading dBμV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
Ch. 353							
1.807 GHz	V	61.7	29.2	43.3	47.6	54.0	-6.4
2.707 GHz	V	51.3	32.5	43.6	40.1	54.0	-13.9
4.513 GHz	V	47.8	36.8	42.2	42.3	54.0	-11.7
1.807 GHz	H	54.8	29.2	43.3	40.6	54.0	-13.4
2.707 GHz	H	49.0	32.3	43.6	37.7	54.0	-16.3
Ch. 393							
1.831 GHz	V	63.6	29.4	43.4	49.6	54.0	-4.4
2.461 GHz	V	53.1	31.6	43.5	41.3	54.0	-12.7
2.743 GHz	V	53.5	32.6	43.6	42.5	54.0	-11.5
4.573 GHz	V	49.1	36.9	42.2	43.8	54.0	-10.2
1.831 GHz	H	55.8	29.3	43.4	41.8	54.0	-12.2
2.743 GHz	H	51.9	32.5	43.6	40.7	54.0	-13.3
4.573 GHz	H	46.3	36.9	42.2	41.1	54.0	-12.9
Ch. 433							
1.855 GHz	V	61.6	29.5	43.4	47.7	54.0	-6.3
2.779 GHz	V	63.8	32.8	43.7	52.8	54.0	-1.1
*4.636 GHz	V	57.8	37.0	42.2	52.6	54.0	-1.4
1.855 GHz	H	55.7	29.4	43.4	41.7	54.0	-12.3
2.779 GHz	H	59.5	32.6	43.7	48.5	54.0	-5.5
4.636 GHz	H	57.0	37.0	42.2	51.8	54.0	-2.1

Comment: Measurements were taken using a Peak detector or Average Value (RBW 1MHz, VBW 1Hz) (marked *)

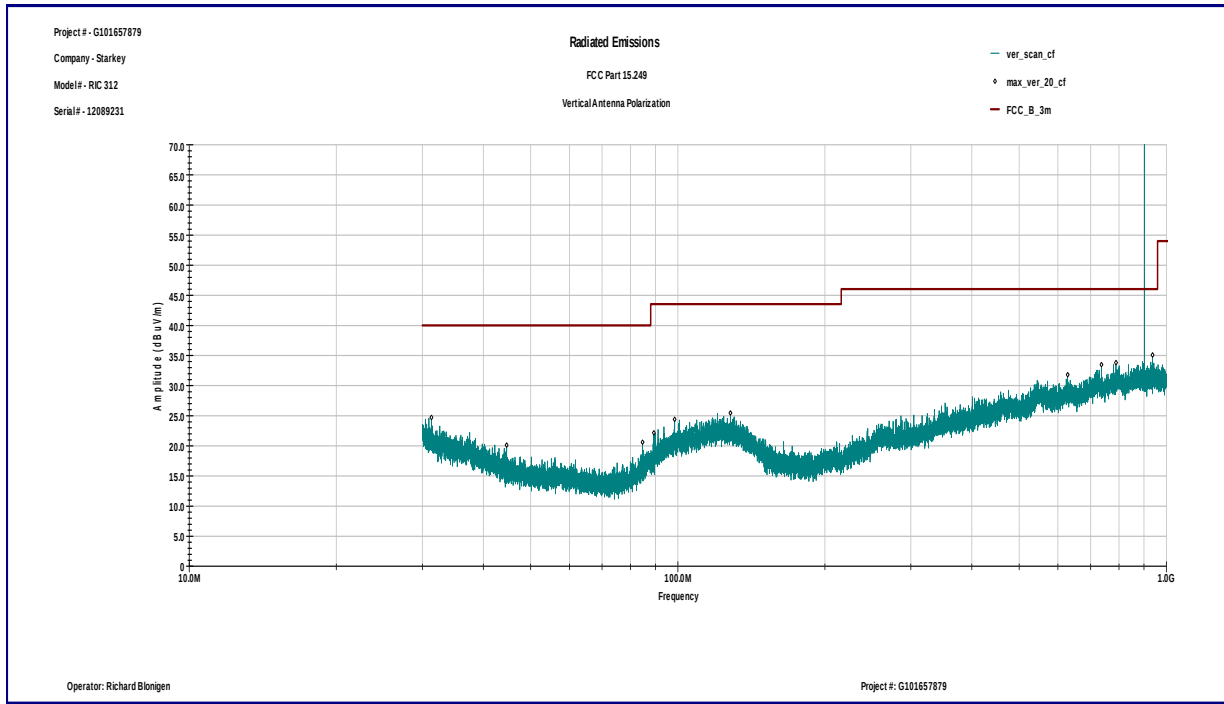
Date:	August 25, 2014	Result: Pass
Standard:	FCC 15.249(a) and (d) / RSS-210 A2.9	
Tested by:	Richard Blonigen	
Test Point:	Enclosure with antenna	
Operation mode:	See Page 5	
Note:	Band Edge Compliance	

Table 3.2.3

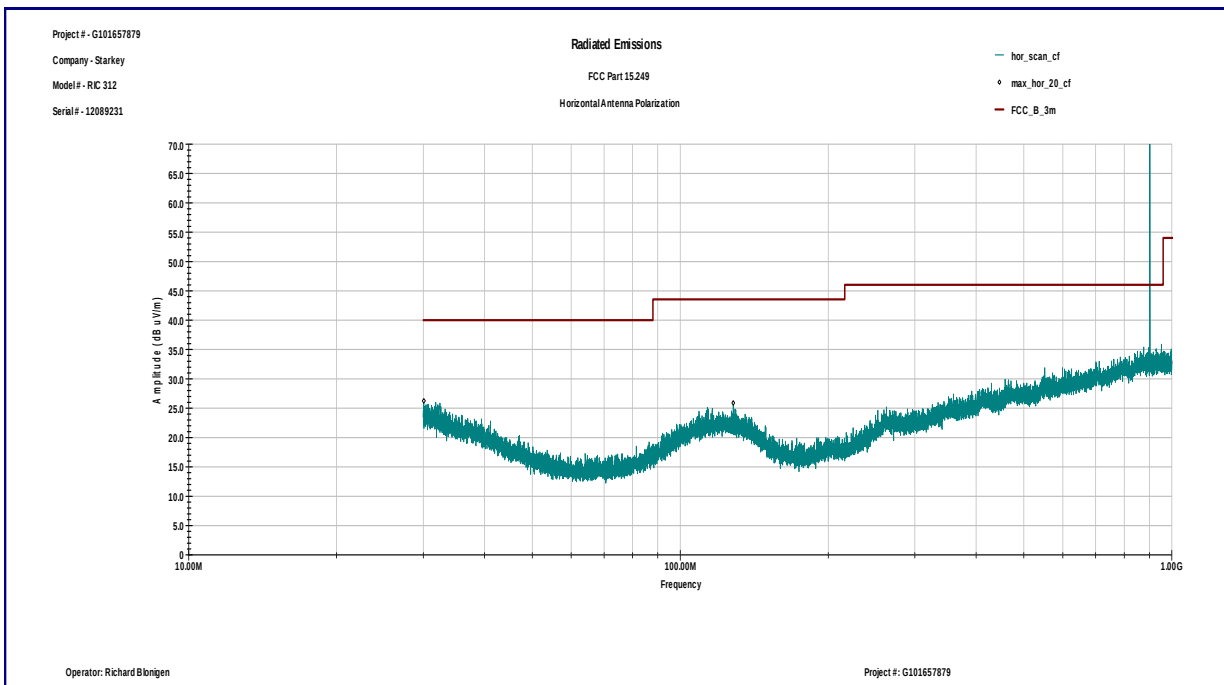
Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	Reading	Total @ 3m	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBμV	dBμV/m	dBμV/m	dB	
902.00	V	100	21.8	3.6	0.0	5.6	31.0	46.0	-15.0	QP
902.00	H	100	21.8	3.6	0.0	5.3	30.7	46.0	-15.3	QP
928.00	V	100	22.0	3.7	0.0	5.6	31.2	46.0	-14.8	QP
928.00	H	100	22.0	3.7	0.0	5.5	31.1	46.0	-14.9	QP

Graph 3.2.1

Vertical antenna polarization

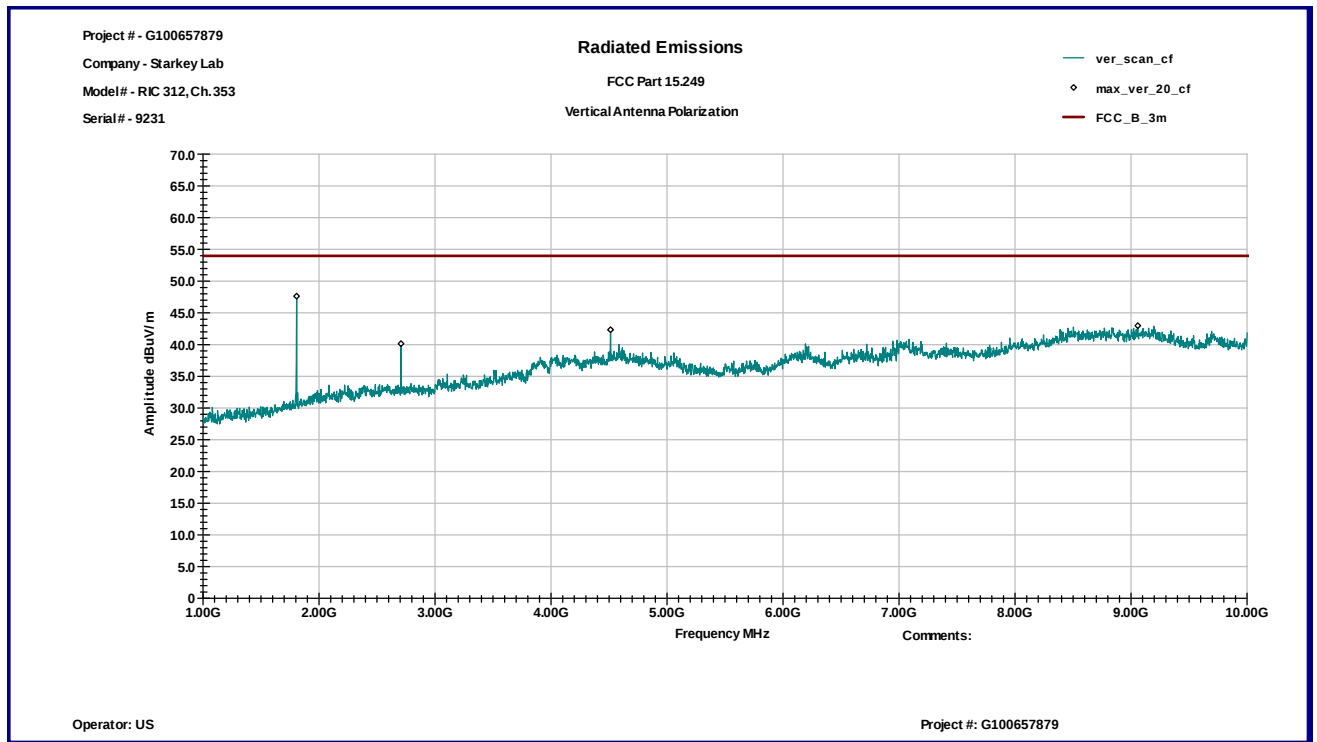


Horizontal antenna polarization

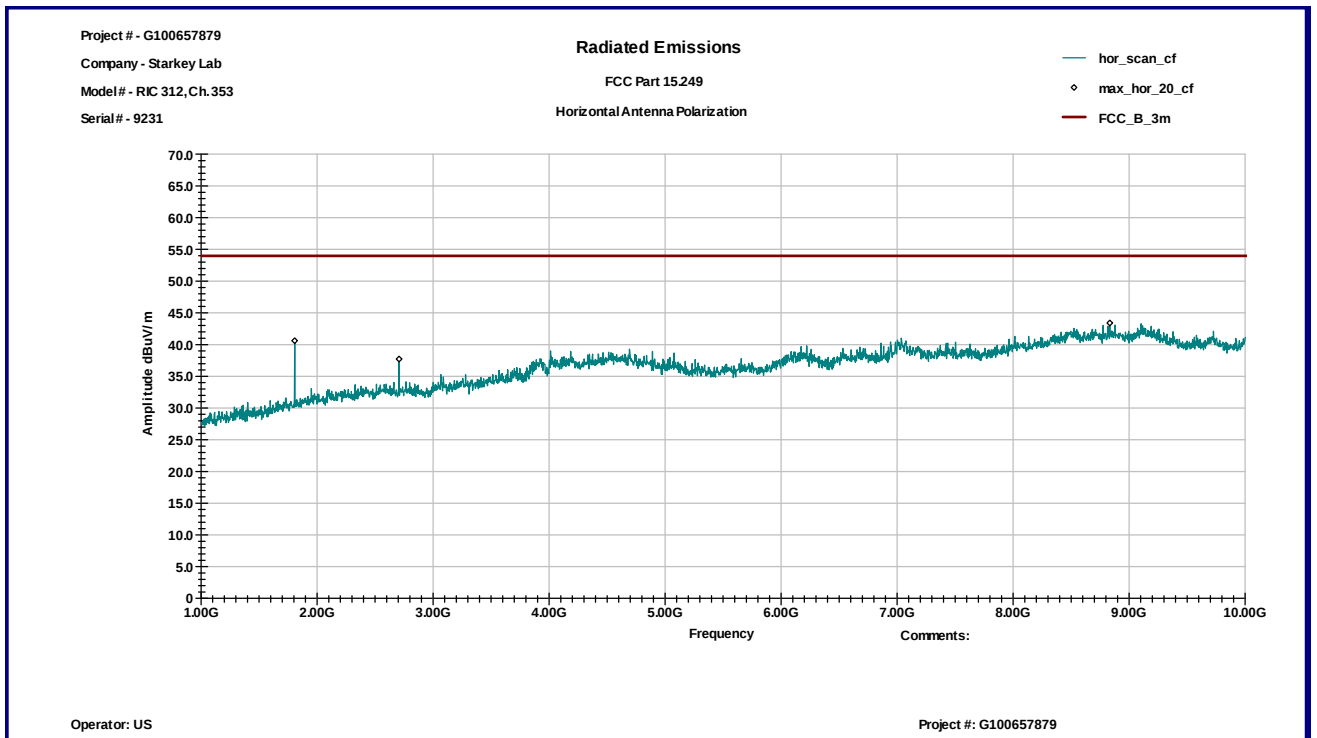


Graph 3.2.2

Vertical antenna polarization

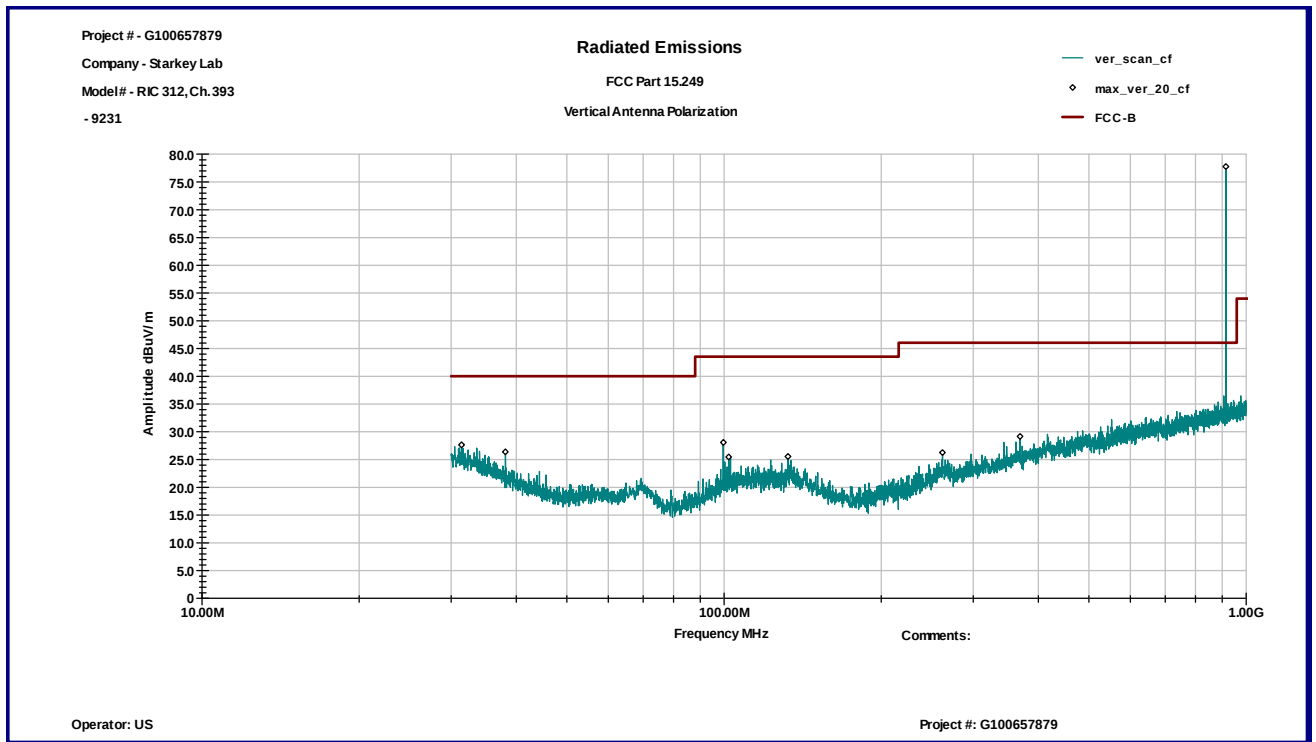


Horizontal antenna polarization

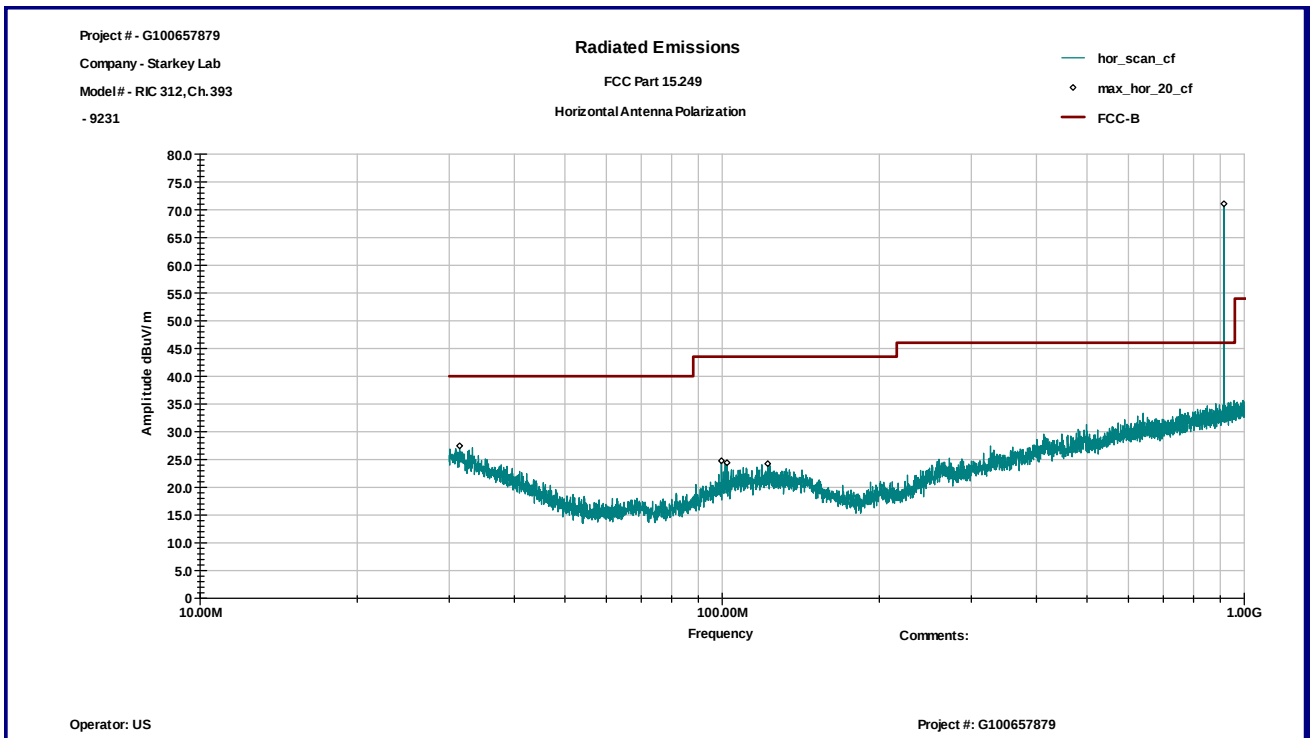


Graph 3.2.3

Vertical antenna polarization

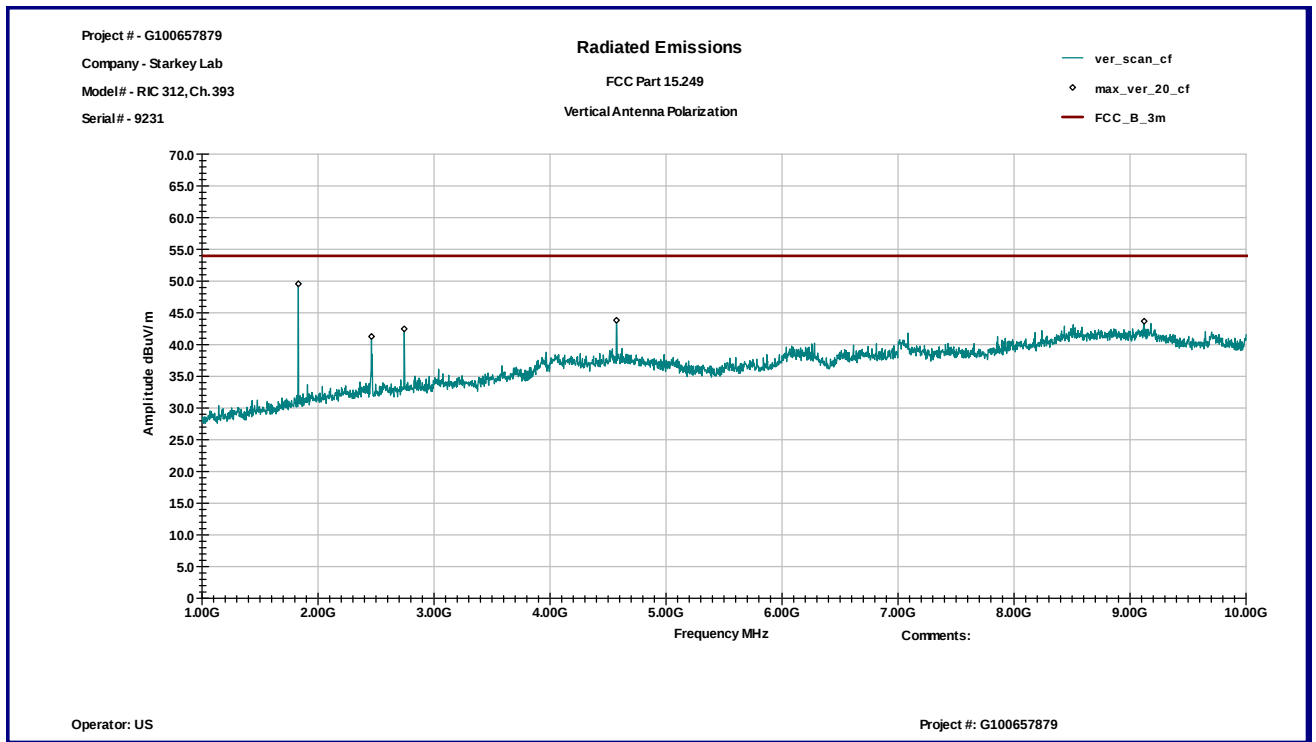


Horizontal antenna polarization

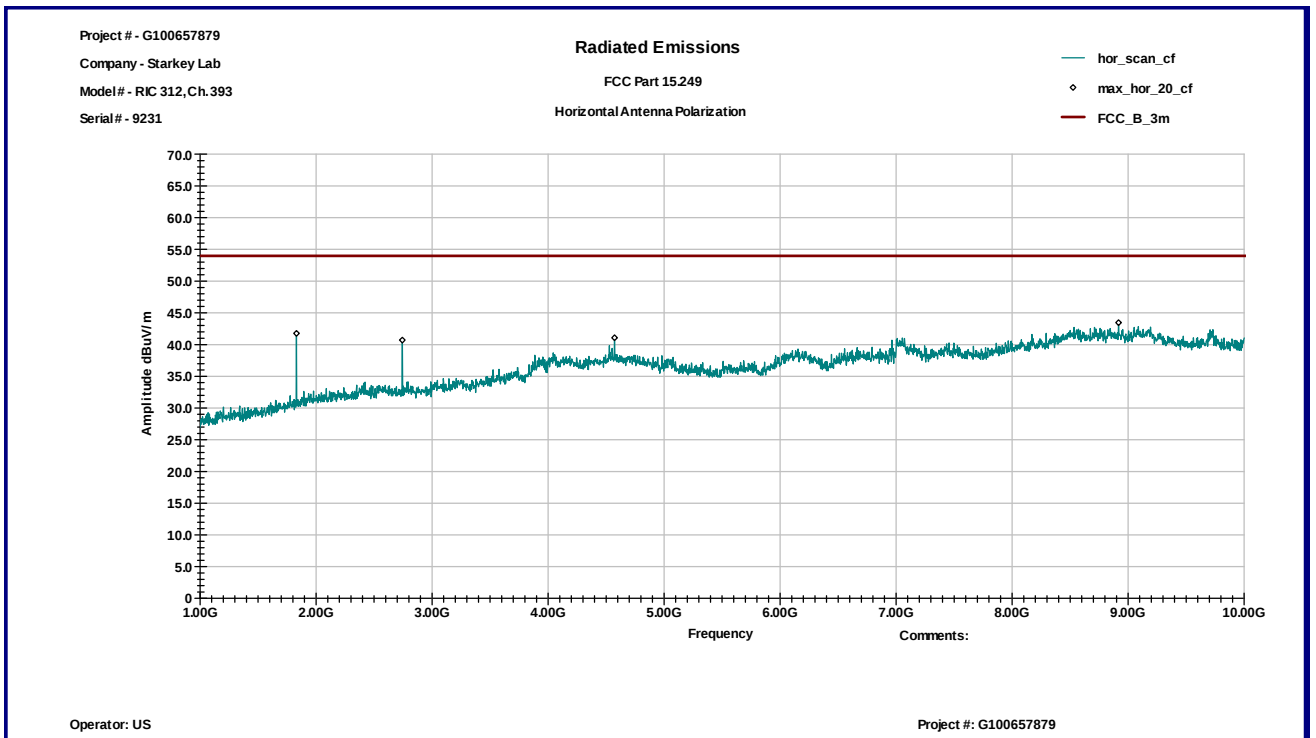


Graph 3.2.4

Vertical antenna polarization

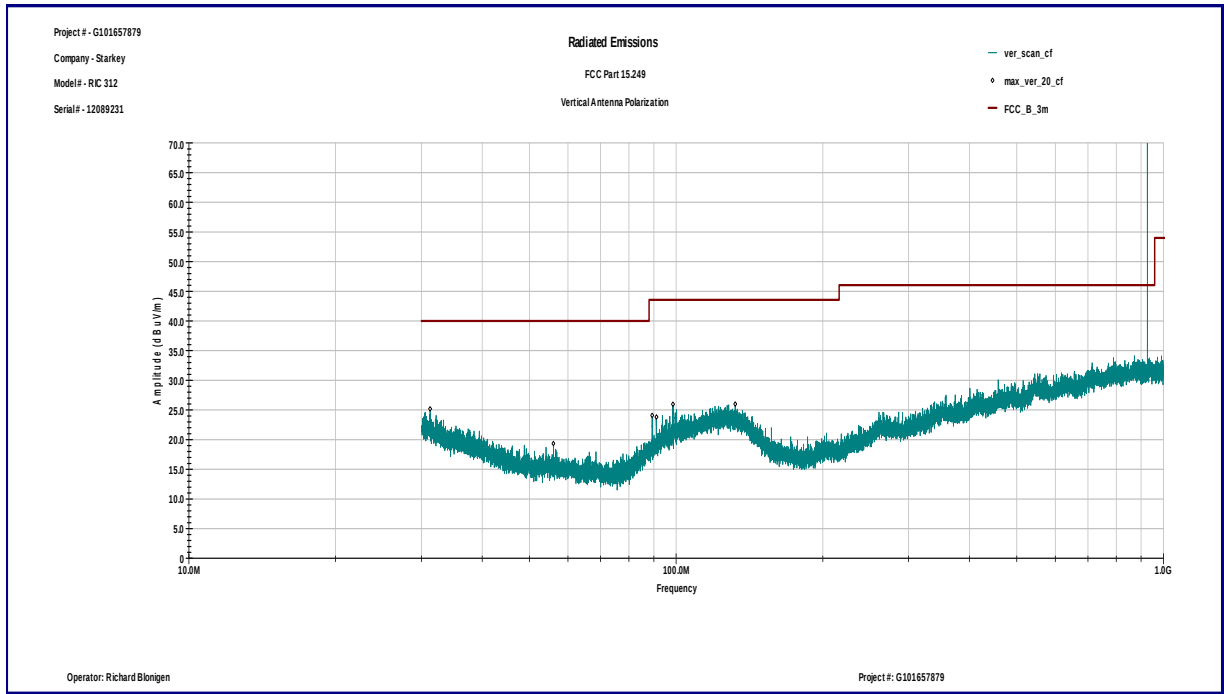


Horizontal antenna polarization

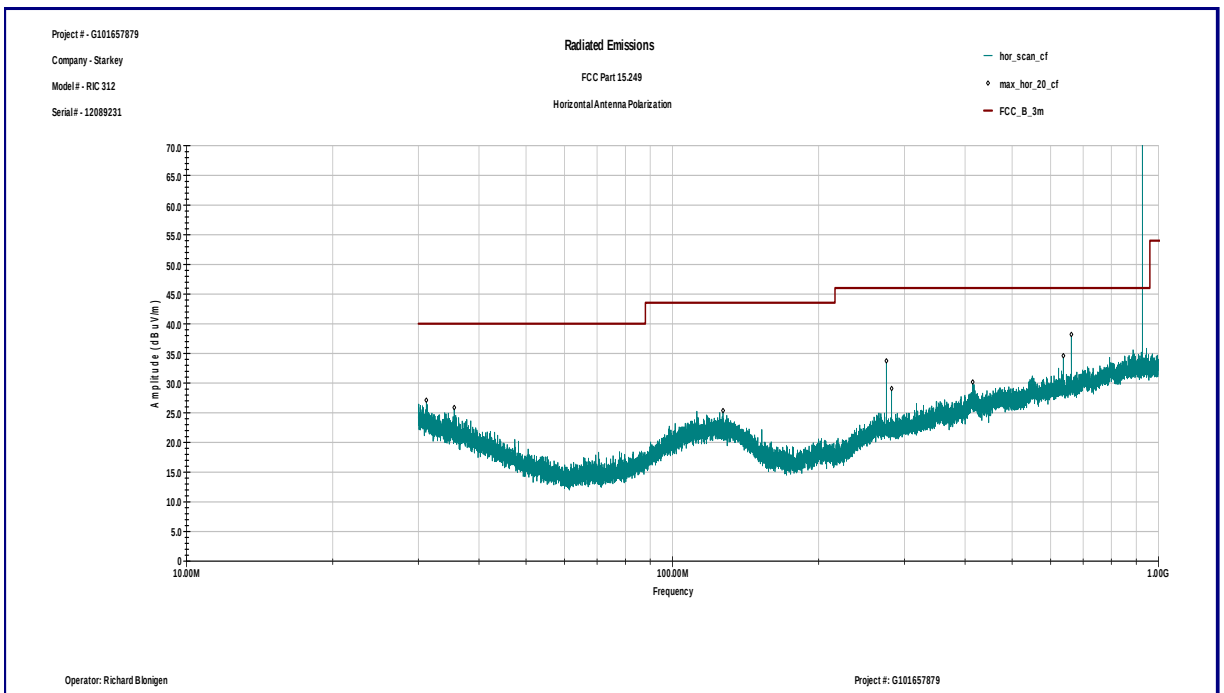


Graph 3.2.5

Vertical antenna polarization

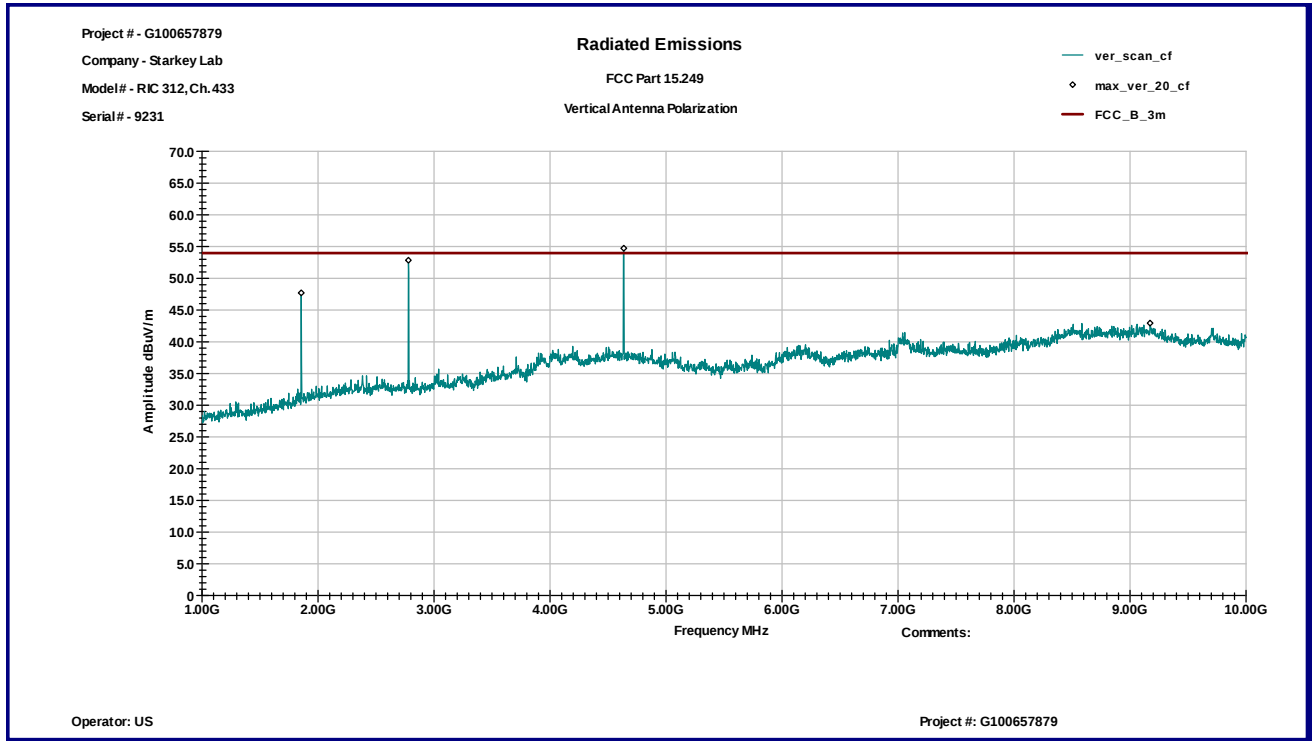


Horizontal antenna polarization

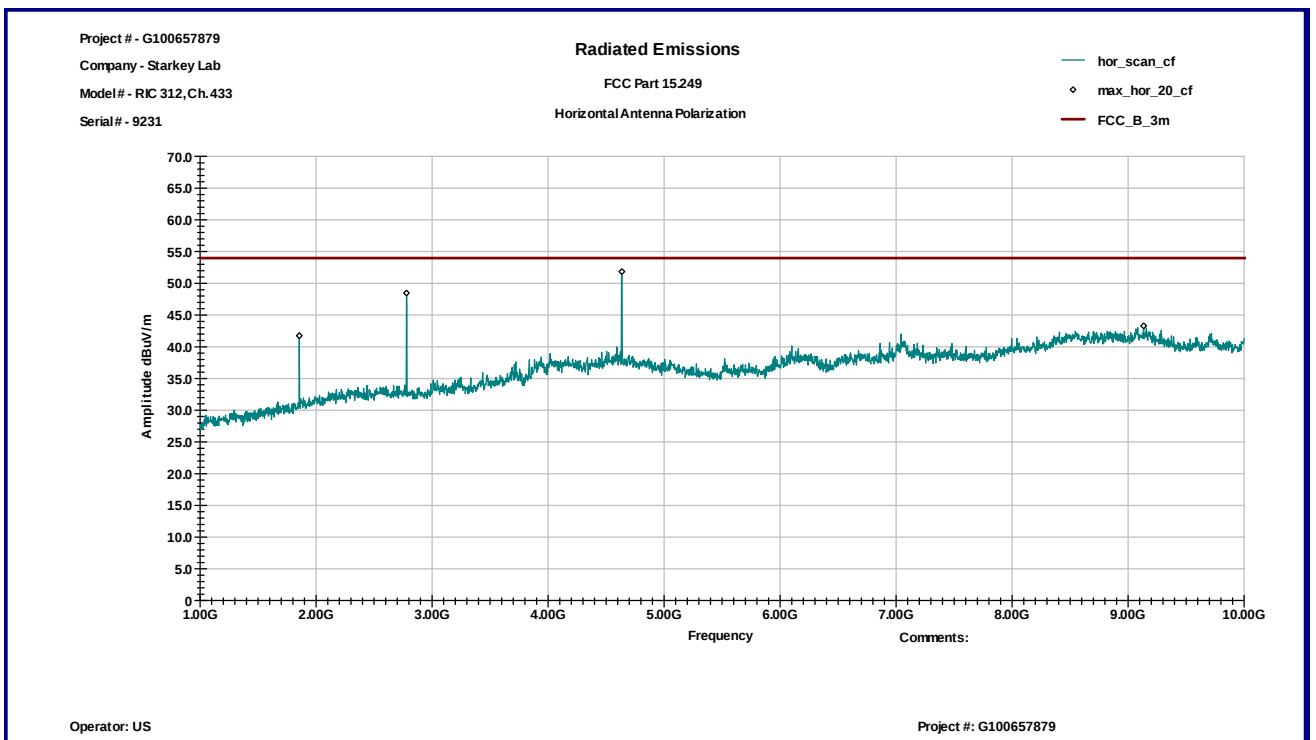


Graph 3.2.6

Vertical antenna polarization



Horizontal antenna polarization





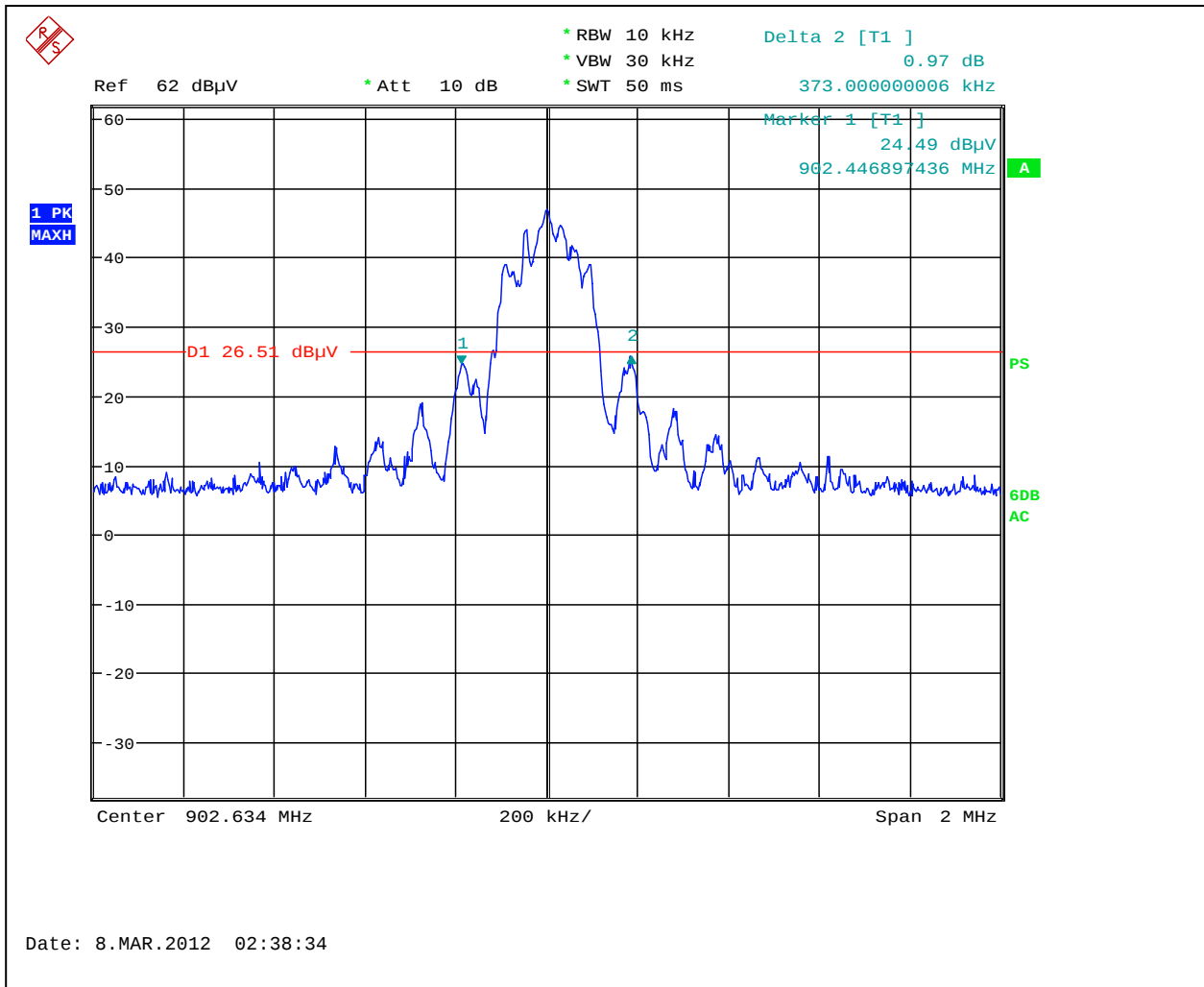
3.3 Bandwidth of Emissions

Center Frequency of operation MHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz
902.44	373.0	360
914.83	368.6	338
926.84	384.6	356

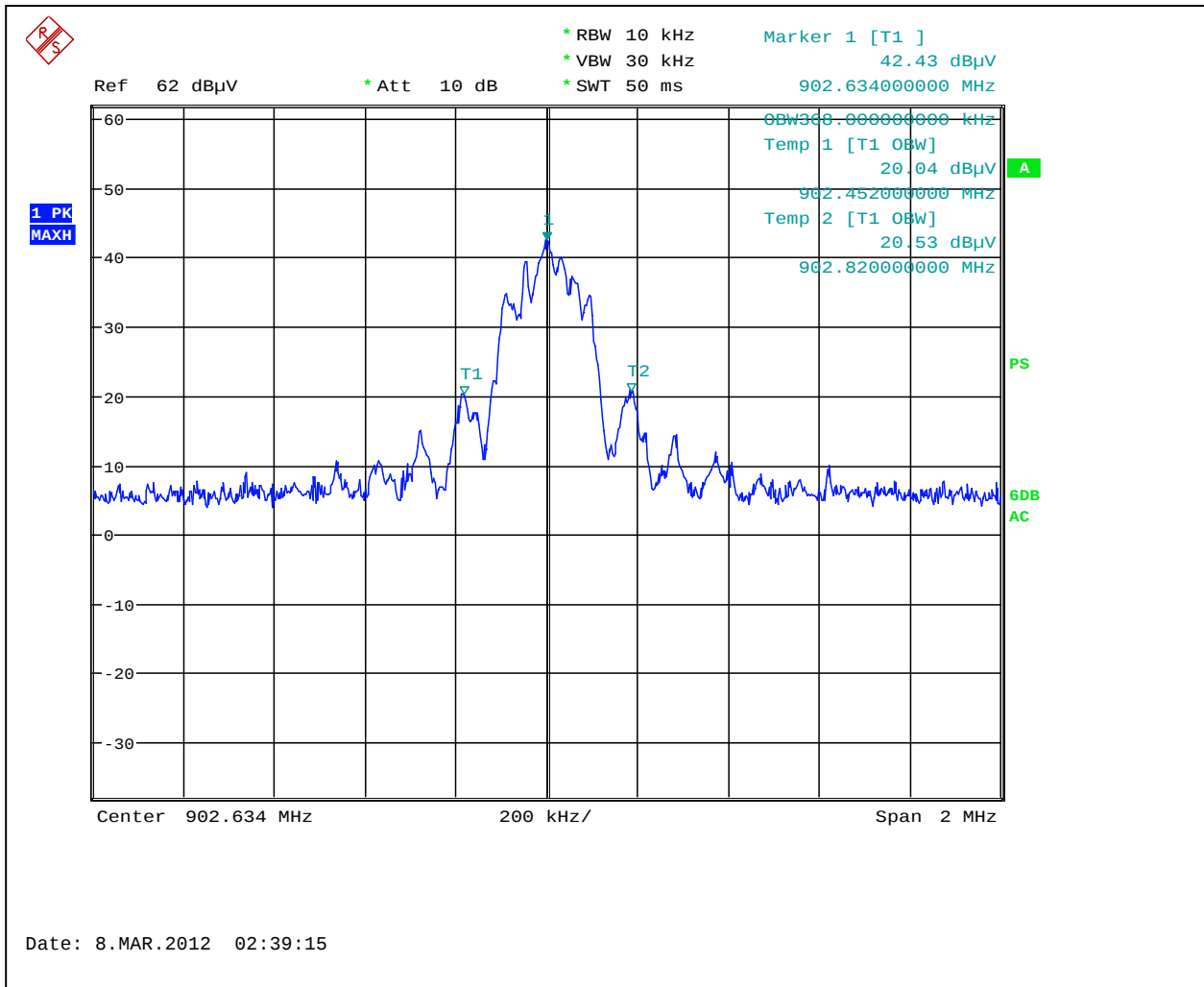
Graphs 3-3-1 to 3-3-6 show bandwidth of emissions

Notes: The bandwidth of emissions is contained within the frequency band of operation

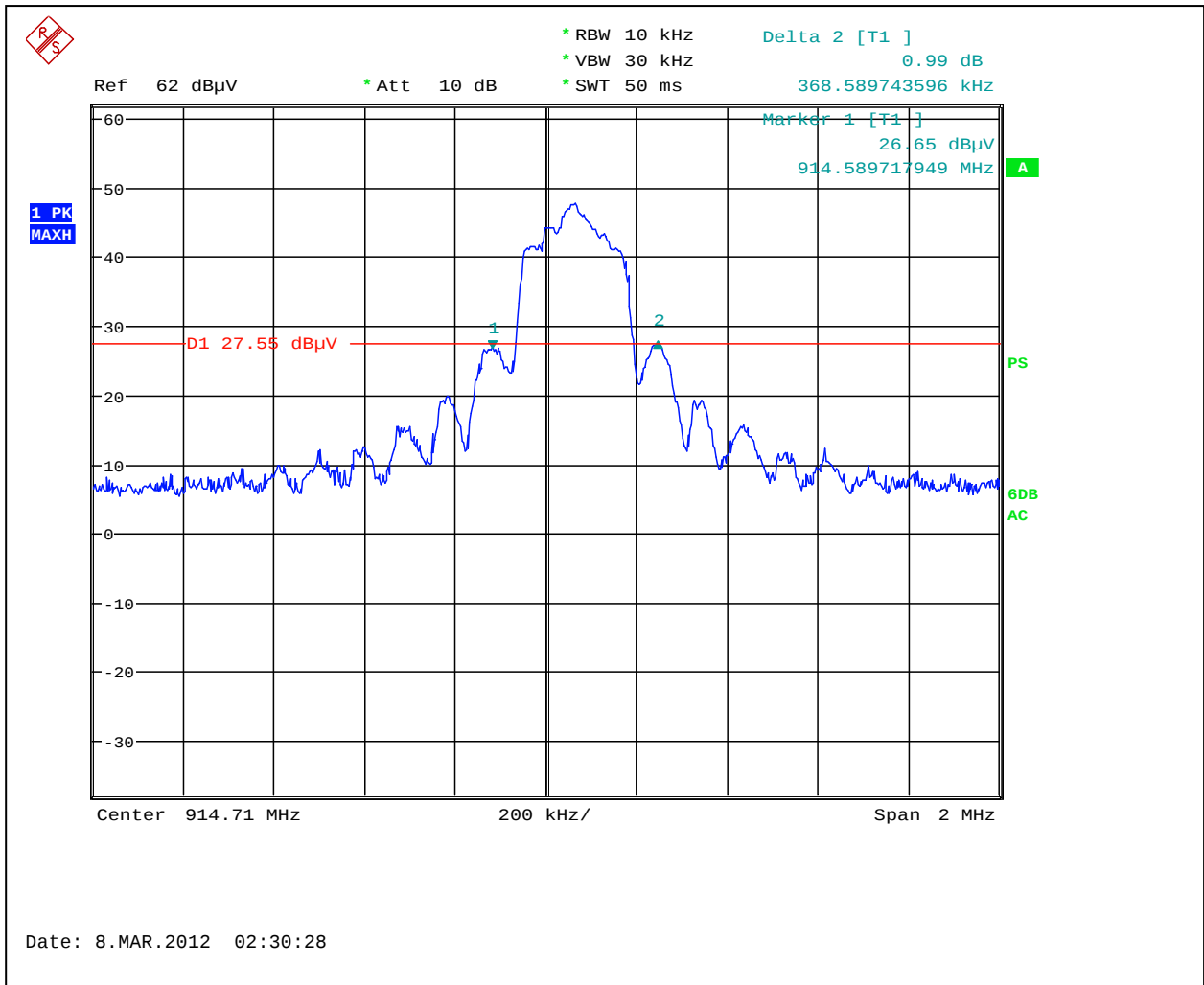
Graph 3.3.1



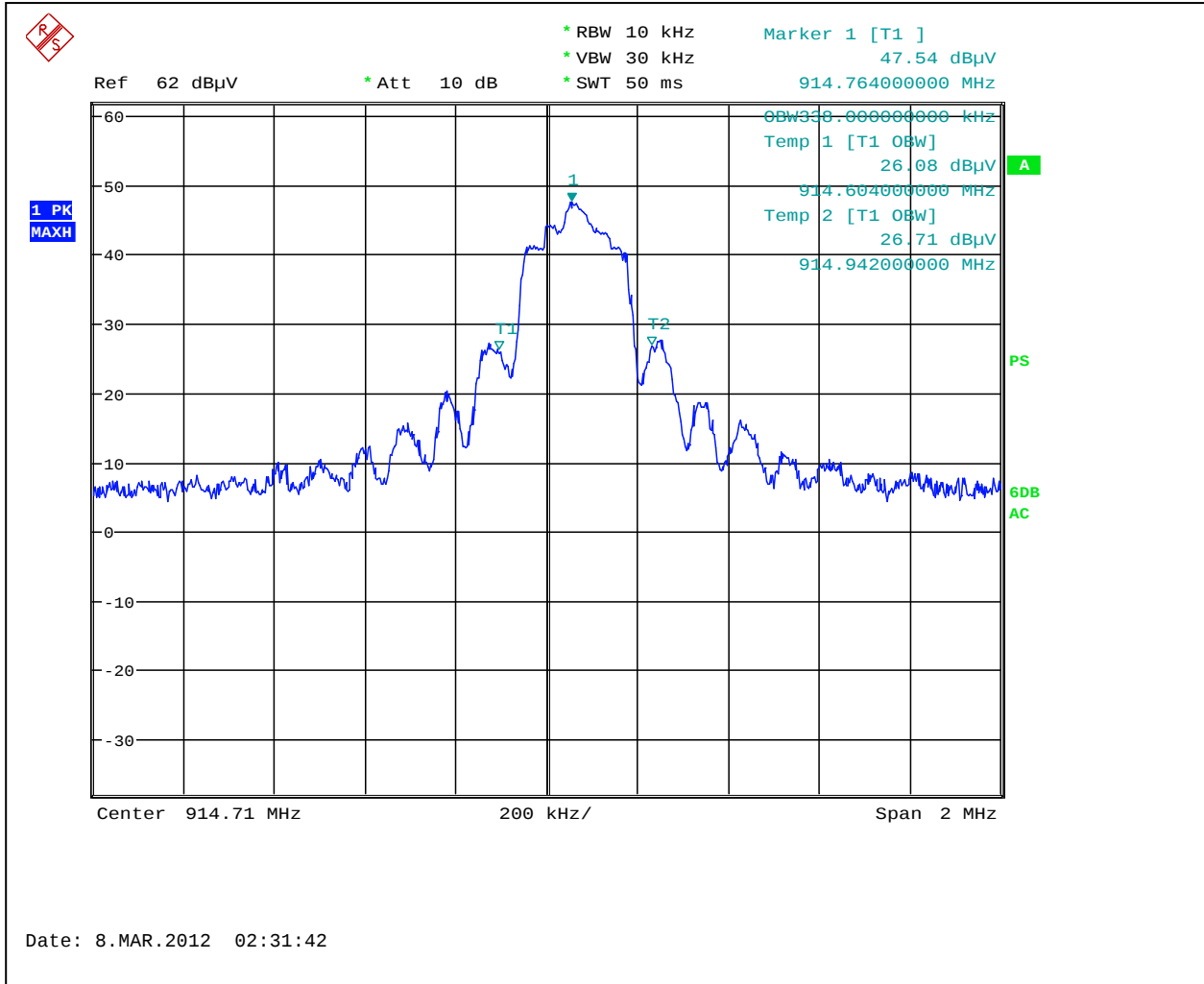
Graph 3.3.2



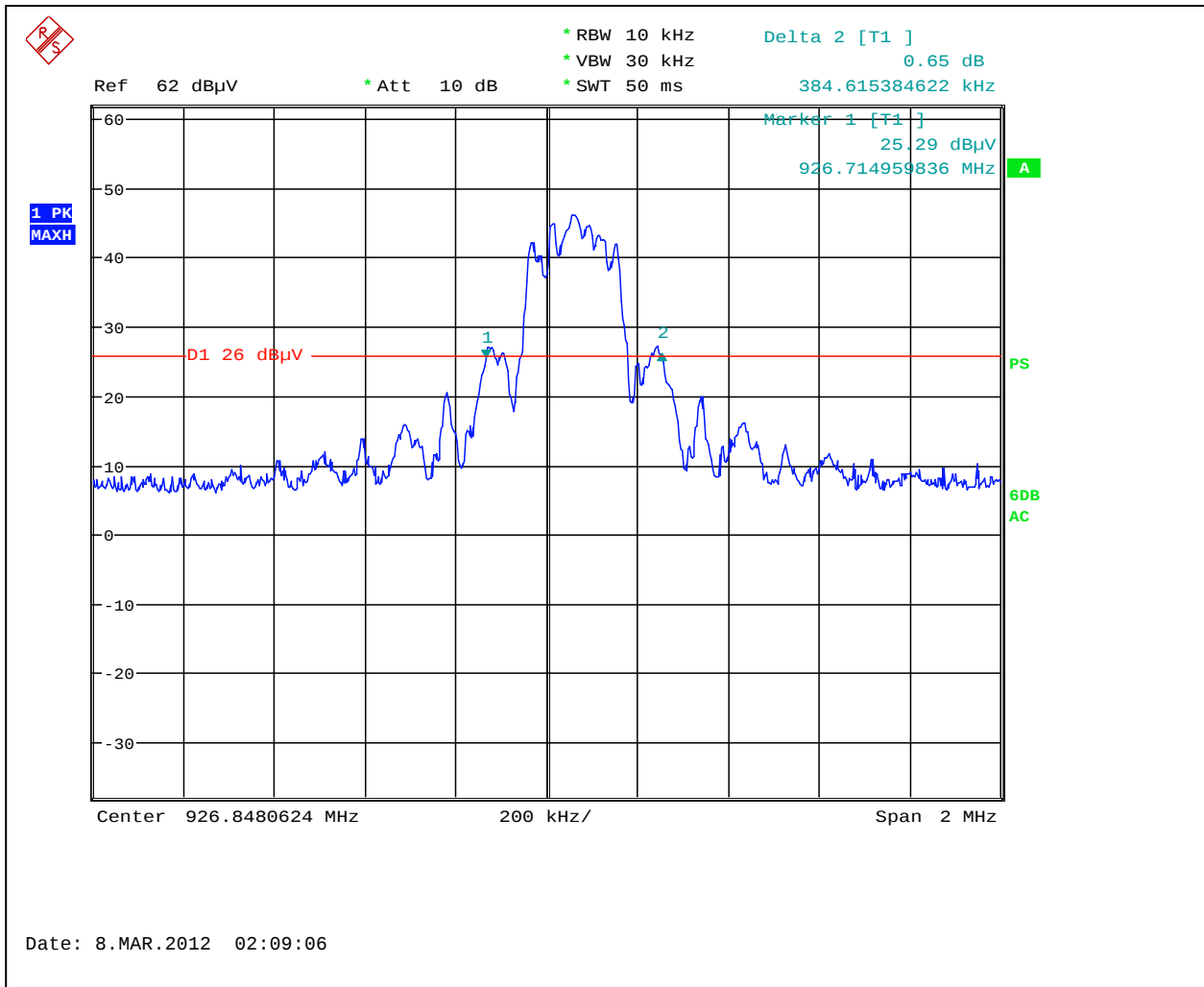
Graph 3.3.3



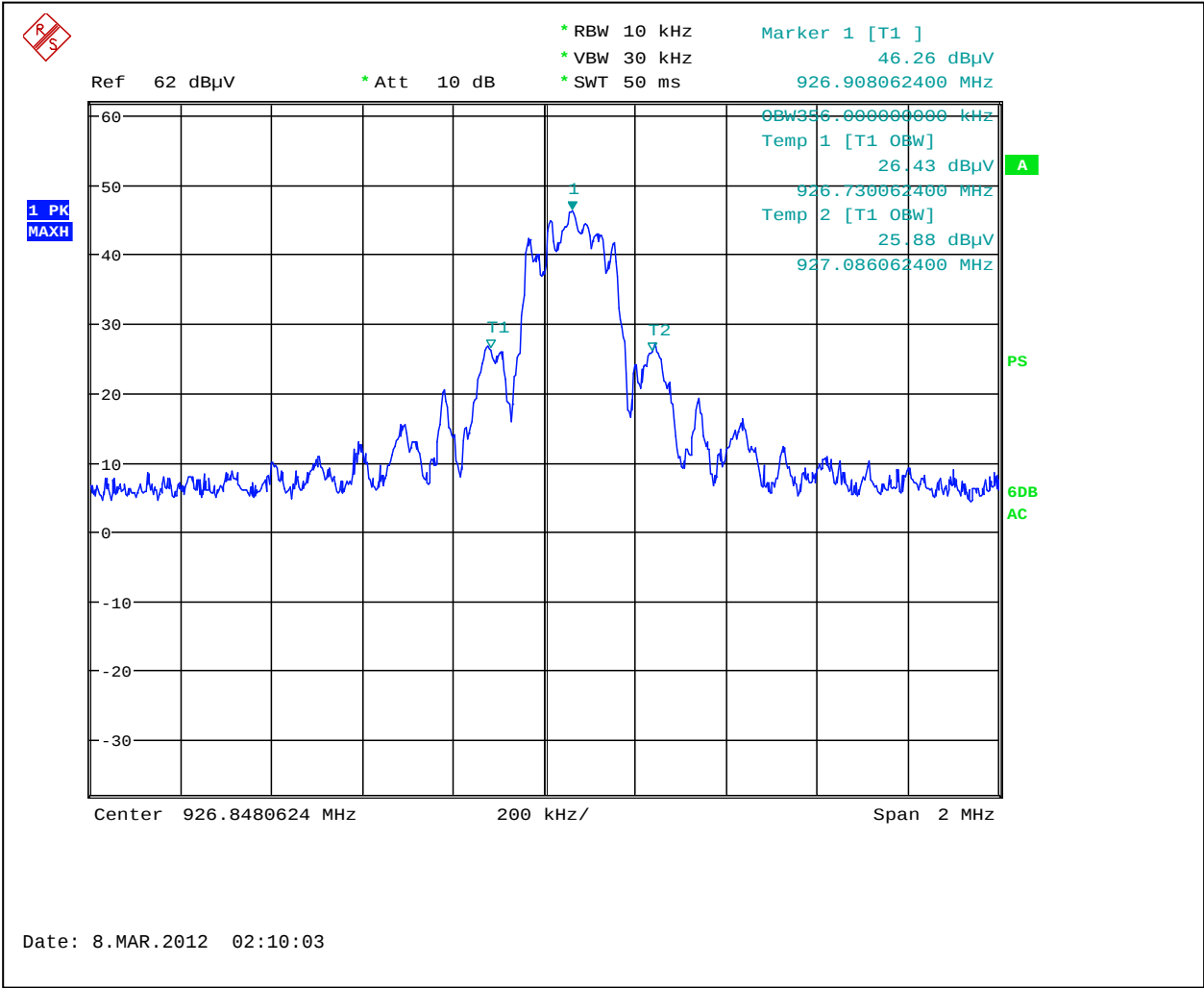
Graph 3.3.4



Graph 3.3.5



Graph 3.3.6





3.4 Transmitter power line conducted emissions

Test result: N/A

Frequency range: 0.15MHz-30MHz

Max. Emissions margin:  dB below the limits

Notes: It was determined from consideration of the electrical characteristics and usage of particular apparatus that Conducted Emissions testing is inappropriate and therefore unnecessary (as battery operated equipment).



3.5 Receiver/digital device radiated emissions

Test location: ☐ OATS ☒ Anechoic Chamber

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Frequency range: 30MHz-5000MHz

Max. Emissions margin: 10.5dB below the limits

Notes: The Radiated Emissions test was performed in the Anechoic chamber at 3m measurement distance (see Table 3.5.1 and Graphs 3.5.1 to 3.5.6). No Radiated Emissions above ambient were detected in the frequency range above 1GHz.
Transmitting frequencies used by the signal generator were excluded from the tables.

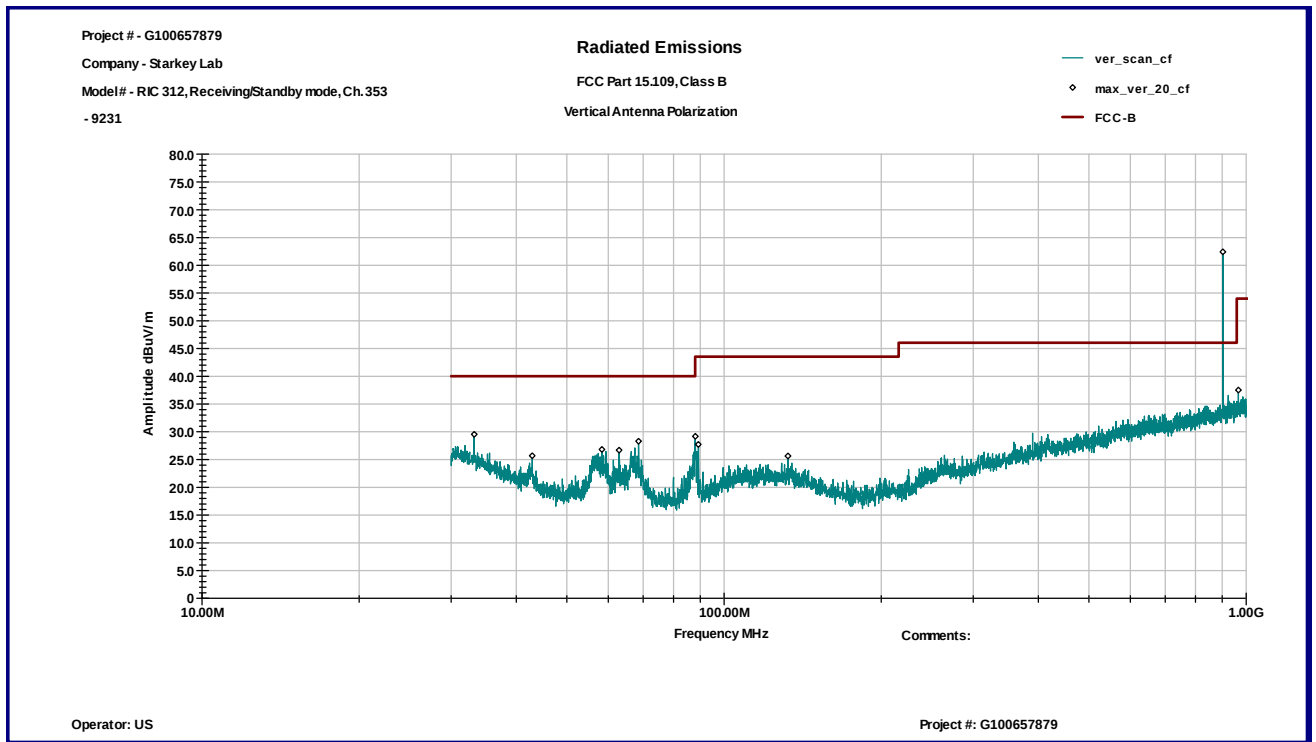
Date:	March 7, 2012	Result: Pass
Standard:	FCC Part 15.109, Class B	
Tested by:	Uri Spector	
Test Point:	Enclosure	
Operation mode:	Receiving/Standby mode	
Note:	30MHz-1000MHz	

Table 3.5.1

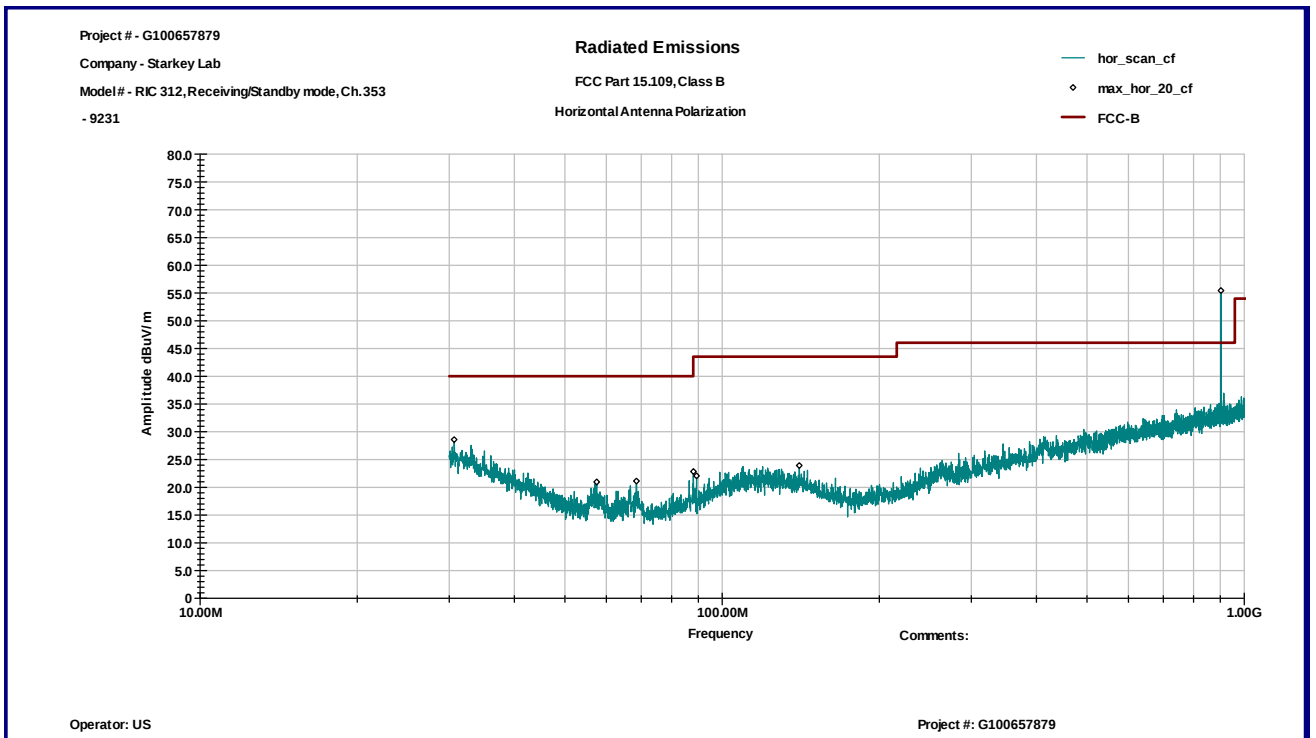
Frequency	Ant. Polarity	Peak Reading dBμV	Ant.Factor dB1/m	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
Ch. 353						
33.221 MHz	V	11.0	18.5	29.5	40.0	-10.5
42.918 MHz	V	12.3	13.3	25.7	40.0	-14.3
58.364 MHz	V	19.3	7.5	26.8	40.0	-13.2
68.588 MHz	V	21.2	7.1	28.3	40.0	-11.7
88.137 MHz	V	19.3	9.8	29.2	43.5	-14.3
132.53 MHz	V	11.9	13.8	25.6	43.5	-17.9
30.658 MHz	H	8.6	20.0	28.6	40.0	-11.4
57.499 MHz	H	13.3	7.7	21.0	40.0	-19.1
68.513 MHz	H	14.0	7.1	21.1	40.0	-18.9
88.137 MHz	H	13.0	9.8	22.8	43.5	-20.7
140.53 MHz	H	10.6	13.3	23.9	43.5	-19.6
Ch. 393						
33.221 MHz	V	10.2	18.5	28.7	40.0	-11.3
58.711 MHz	V	20.3	7.4	27.7	40.0	-12.3
68.588 MHz	V	21.7	7.1	28.8	40.0	-11.2
88.808 MHz	V	20.3	9.9	30.2	43.5	-13.3
132.53 MHz	V	11.5	13.8	25.3	43.5	-18.2
30.797 MHz	H	7.9	19.9	27.8	40.0	-12.2
45.342 MHz	H	10.4	12.2	22.6	40.0	-17.4
58.849 MHz	H	12.4	7.4	19.8	40.0	-20.2
68.588 MHz	H	13.8	7.1	20.9	40.0	-19.1
89.33 MHz	H	11.8	10.0	21.8	43.5	-21.7
102.09 MHz	H	11.5	12.7	24.2	43.5	-19.3
Ch. 433						
30.554 MHz	V	9.2	20.0	29.3	40.0	-10.8
42.641 MHz	V	13.2	13.5	26.6	40.0	-13.4
57.464 MHz	V	20.4	7.7	28.1	40.0	-12.0
66.946 MHz	V	21.8	7.0	28.8	40.0	-11.2
88.137 MHz	V	21.2	9.8	31.0	43.5	-12.5
128.95 MHz	V	12.0	13.8	25.8	43.5	-17.7
30.416 MHz	H	7.8	20.1	27.9	40.0	-12.1
56.737 MHz	H	12.6	7.9	20.5	40.0	-19.5
67.692 MHz	H	14.1	7.1	21.2	40.0	-18.8
102.91 MHz	H	11.5	12.8	24.3	43.5	-19.3

Graph 3.5.1

Vertical antenna polarization

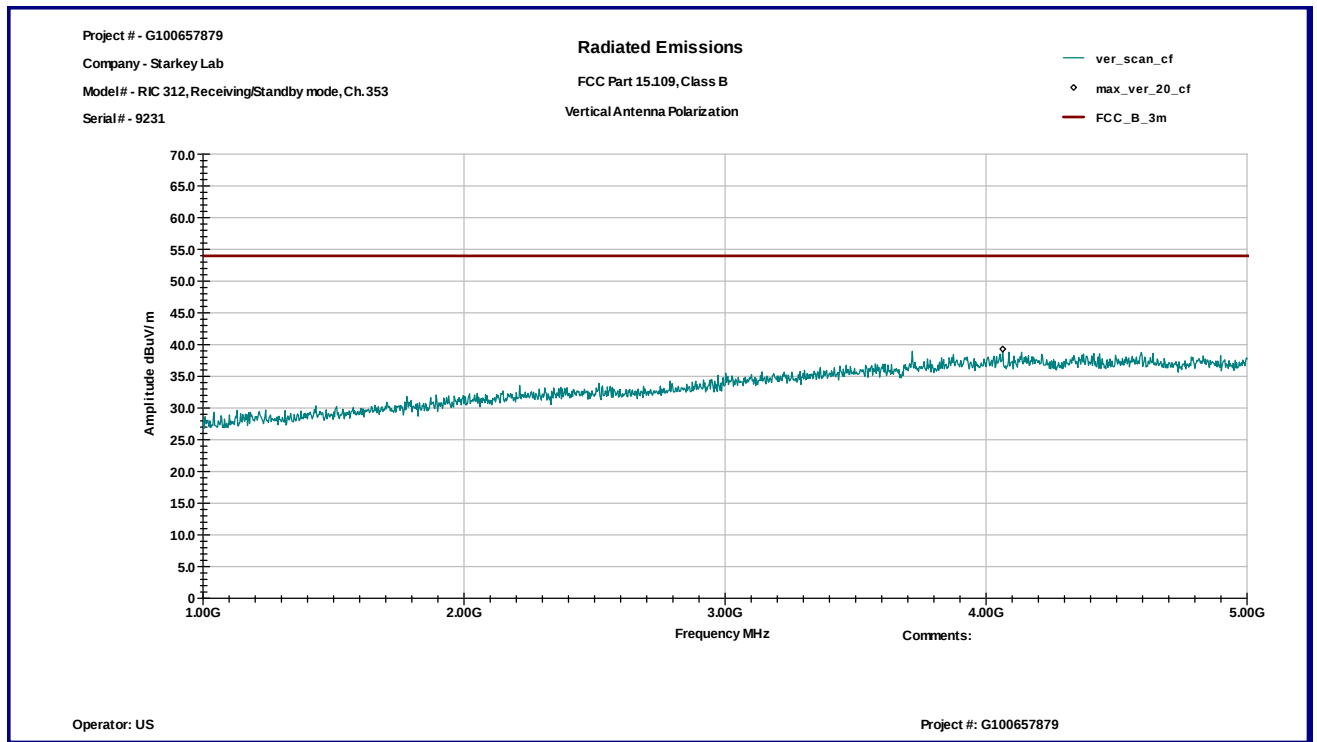


Horizontal antenna polarization

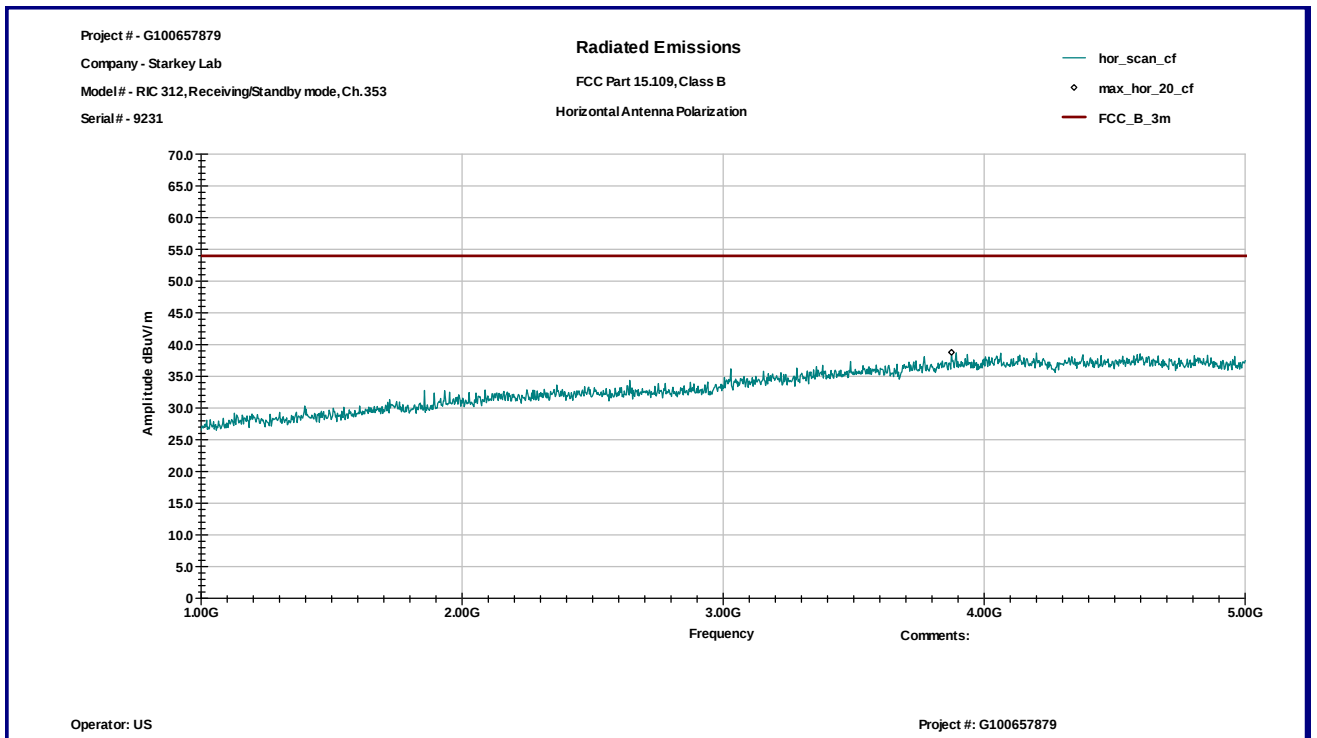


Graph 3.5.2

Vertical antenna polarization

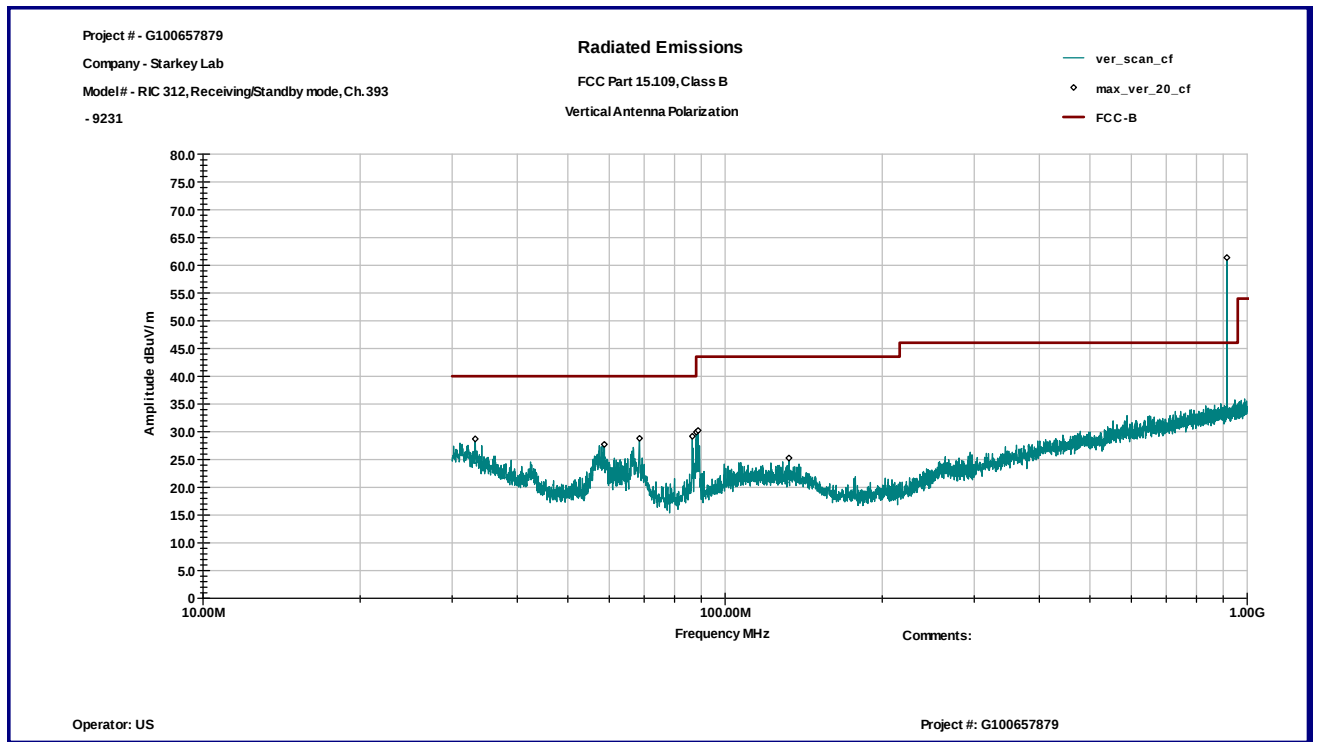


Horizontal antenna polarization

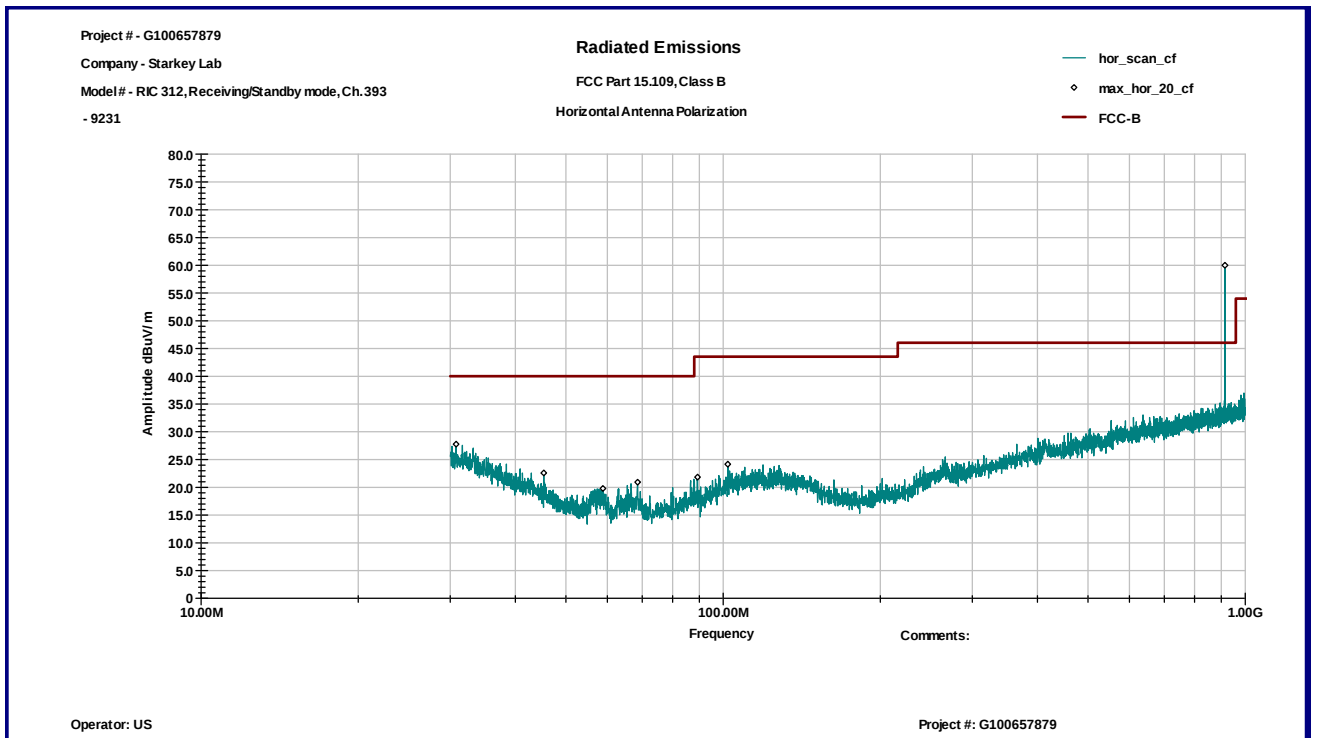


Graph 3.5.3

Vertical antenna polarization

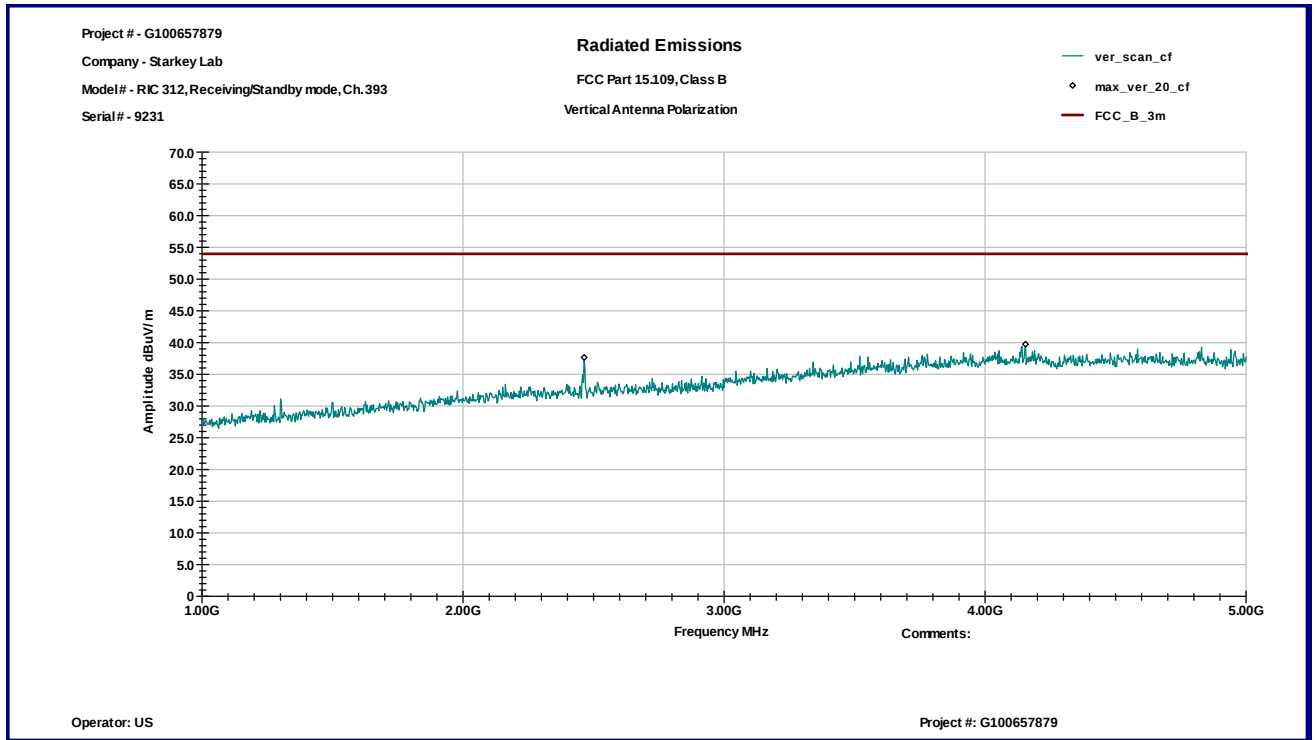


Horizontal antenna polarization

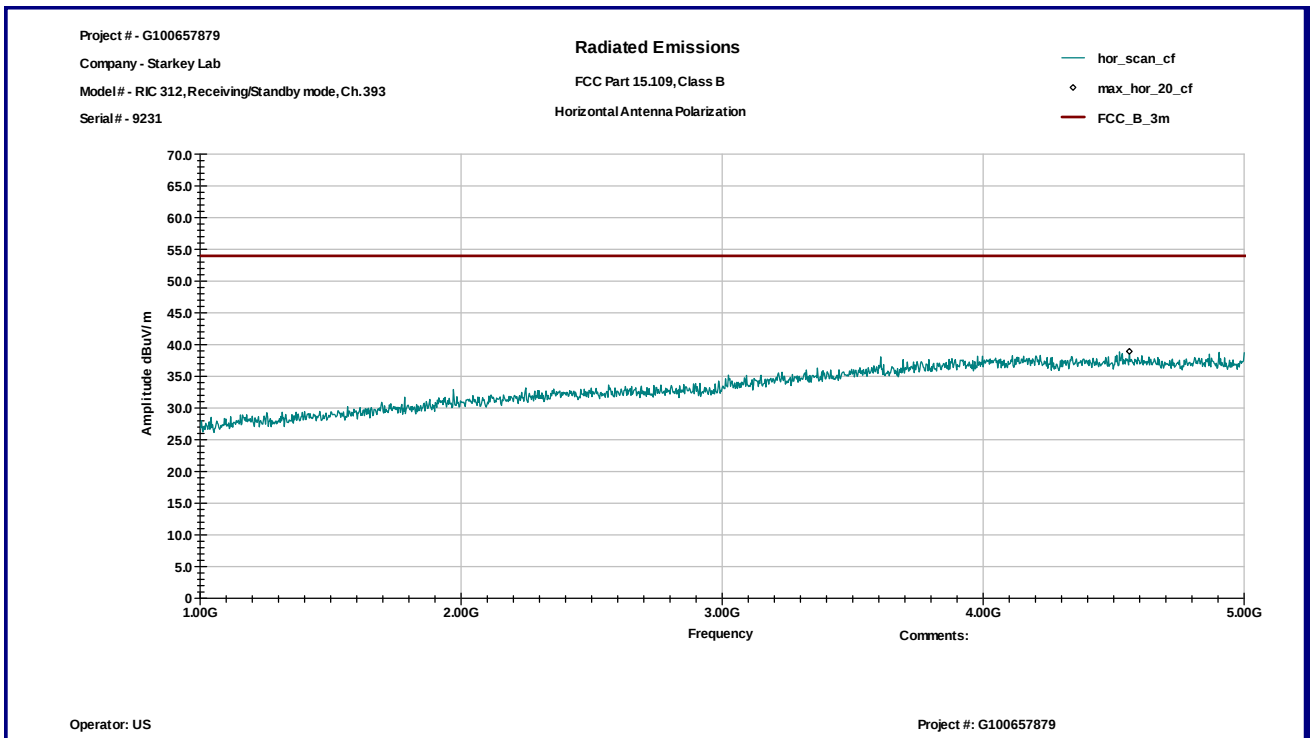


Graph 3.5.4

Vertical antenna polarization

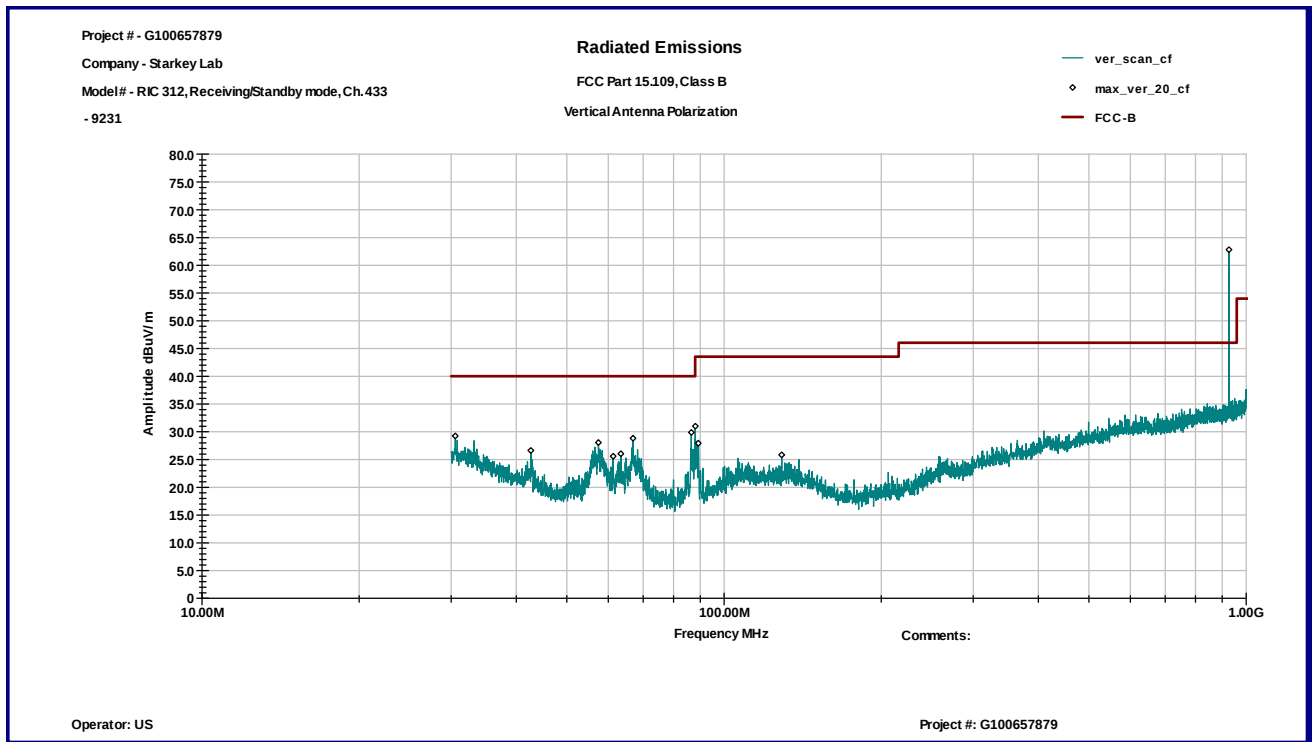


Horizontal antenna polarization

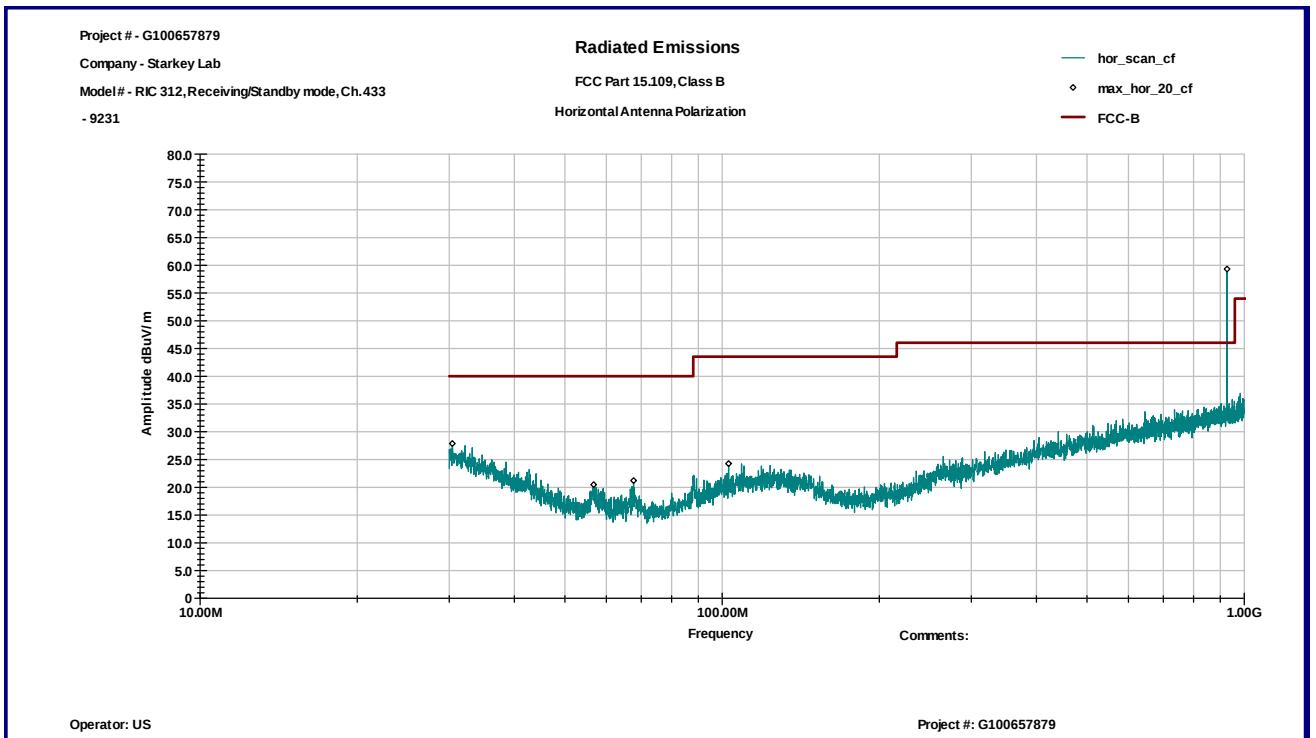


Graph 3.5.5

Vertical antenna polarization

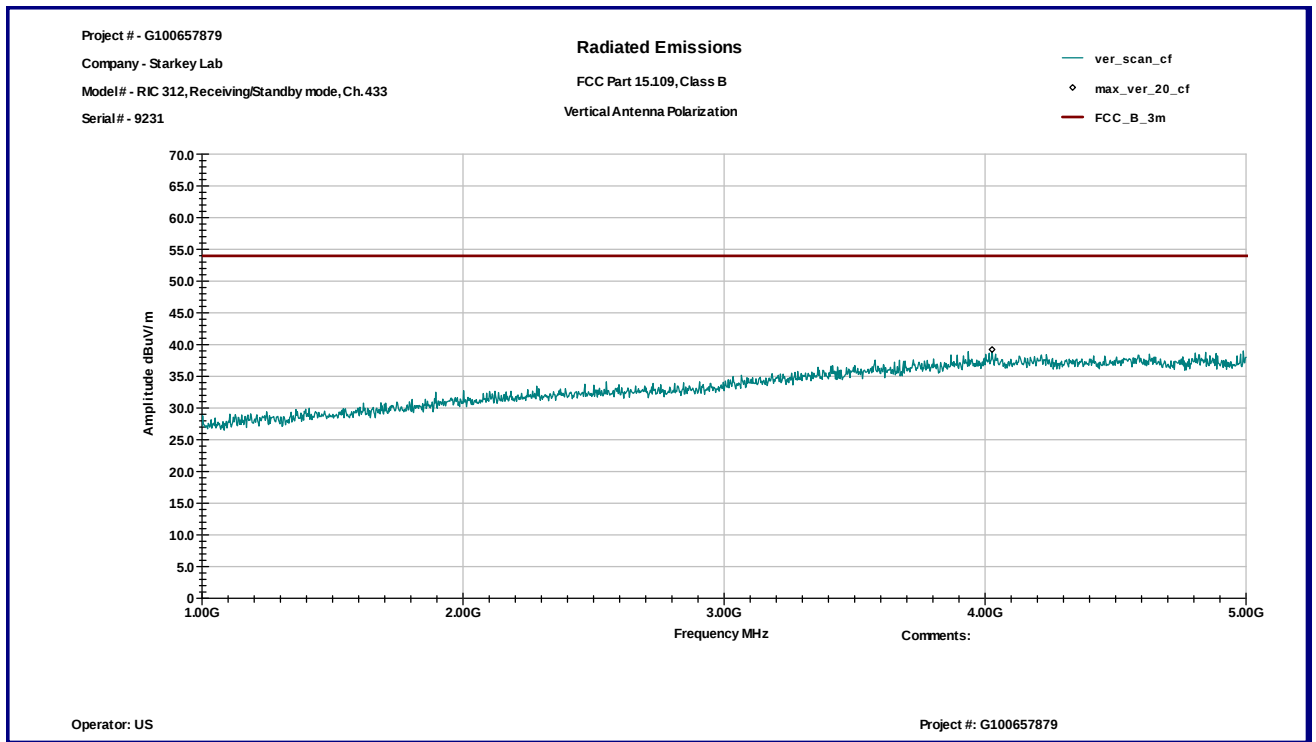


Horizontal antenna polarization

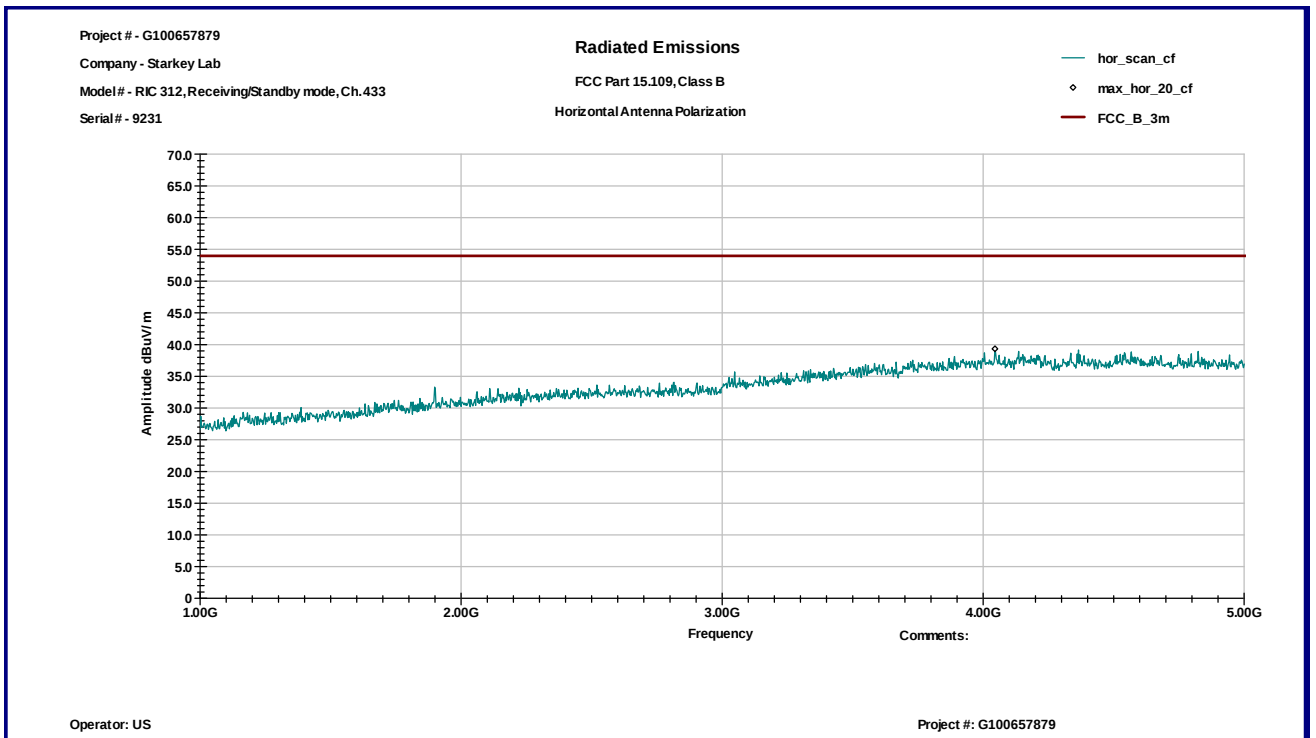


Graph 3.5.6

Vertical antenna polarization



Horizontal antenna polarization





3.6 Digital device conducted emissions

Test result: N/A

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: dB below the limits

Notes: It was determined from consideration of the electrical characteristics and usage of particular apparatus that Conducted Emissions testing is inappropriate and therefore unnecessary (as battery operated equipment).



4.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	CAL DUE	USED
Spectrum Analyzer	R & S	ESU	100398	25283	12/09/2012	☒
Spectrum Analyzer	R & S	FSP 40	100024	12559	11/17/2012	☒
Bicono-Log Antenna	Schaffner-Chase	CBL 6112 B	2468	9734	11/08/2012	☒
Horn Antenna	EMCO	3115	9507-4513	9936	04/29/2012	☒
LISN	Fischer Custom Communications	FCC-LISN-2 MOD.SD	316	9945	05/26/2012	☐
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1402232	172081	10/31/2012	☒
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBV	☒
Spectrum Analyzer	R & S	FSP 40	100024	12559	12/12/2014	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1402232	172081	11/12/2014	☒
Bicono-Log Antenna	Teseq	CBL6112D	32859	25289	08/30/2014	☒